Section M - Exposure Information Requirements

3. Small quantity of waste released - Releases from the facility will probably be short-lived episodic events which does not allow for chronic exposure.

The EPA Appendix A checklist was utilized in the development of this EIR. Some additional general information which has not been submitted previously has been provided in this section as follows:

1. Zoning maps for an area four miles around the unit which include the cities of Dearborn, Melvindale and Allen Park. Refer to pages 415-417.
2. Two aerial photographs of the facility and surrounding community which show the north (Dearborn) and south (Allen Park) half of the region. Refer to pages 418-419.
3. Tabulation of current leachate analyses which indicates the toxicity of the wastewater to be managed. Refer to page 420.
4. Current estimate of annual waste volumes that have been disposed of at the unit. Refer to page 421.
5. Neighborhood cancer incidence analysis performed by the Biostatistics Unit of the Michigan Cancer Foundation, Division of Epidemiology is provided on pages 428-439.

Known Release Information

Information concerning prior releases that may have occurred in the past relating to nearby solid waste activities is provided in Section L pages 369-401 of the Part B license application.

APPENDIX A. INFORMATION REQUIREMENTS CHECKLIST

1. General Information

Reg. Cite	Description	Location in RCRA Permit Application Page #
	Information in Part B Application	
270.14(b)(1)	General description of facility	26
270.14(b)(2) and (3)	Chemical and physical analyses of wastes	73
270.14(b)(4)	Access control and security description of active portion	268
270.14(b)(5), 270.17(d), and 270.21(d)	General inspection schedule and procedures	271
270.14(b)(6)	Preparedness and prevention documentation	268
270.14(b)(7)	Contingency plan	277
270.14(b)(8)	Preventive procedures	268
270.14(b)(11)(i) and (ii)	Facility location information	61
270.14(b)(13)	Closure plan	322
270.14(b)(13)	Post-closure care plan	322
270.14(b)(17)	Documentation of insurance	322

APPENDIX A. INFORMATION REQUIREMENTS CHECKLIST

1. General Information (continued)

Reg. Cite	Description	Location in RCRA Permit Application Page #
	Information in Part B Application (continued)	
270.14(b)(19)	Topographic map (site plotted on USGS quadrangle maps)	61 154A 154.1A
270.21(a) and 270.17(a)	List of wastes placed or to be placed in each unit	73
	Additional Information	
	Existing risk assessment reports and information, including liability insurance analyses, claims, and settlements	(428-439)
	Land use and zoning map(s) for an area of 4 miles around the unit	(415-417)
	Existing aerial photographs of the facility	152A (418-419)
	Identify and summarize any waste analysis data not already submitted; provide additional data as discussed in text	(420)
	Current estimate of annual amount of waste received and description of any pretreatment process used	(421)
	Identification of any Federal, State, or local inspection or compliance records related to environmental and health programs; include descriptions of any major violations	(422)

( ) Denotes pages included with this submittal.

APPENDIX A. INFORMATION REQUIREMENTS CHECKLIST

2. Ground Water Pathway

Reg. Cite	Description	Location in RCRA Permit Application Page #
	Information in Part B Application	
270.14(c)(1)	Interim status ground-water monitoring results	211A
270.14(c)(2)	Identification of uppermost aquifer, including flow rate and direction	210
270.14(c)(3) and 270.14(b)(19)	Topographic maps related to ground-water protection (well location, water table elevation contours, etc.)	210
270.14(c)(4) (i) and (ii)	Description of existing contamination	Not Applicable
270.14(c)(5)	Detailed plans for ground-water monitoring program	163
270.14(c)(6)	Description of detection monitoring program (if applicable)	Not Applicable
270.14(c)(7) and (c)(7)(ii)	Description of compliance monitoring program and characterization of contaminated ground water (if applicable)	Not Applicable
270.14(c)(7)(iv)	ACL demonstration (if any)	Not Applicable
270.14(c)(8)	Corrective action program (if applicable)	Not Applicable
270.17(b)(1) 270.21(b)(1)	Description of liner and leachate collection systems (if applicable)	99A

2. Ground-Water Pathway (Continued)

Additional Information	Description	Page #
	Existing map showing location of all known wells within three miles ; number and location of drinking water wells	(424)
	Discussion of ground-water uses within three miles of unit	(423)
	Regional map showing areas of ground-water recharge and discharge	(424)
	Net precipitation using net seasonal rainfall or other available data	122A
	Unless otherwise reported to EPA, available well data indicating a release, and information on any affected public or private water supplies, including populations served	Not Applicable (423)
	Any known food chain contamination due to prior release from the unit to ground water	Not Applicable (423)

3. Surface Water Pathway

Reg. Cite	Description	Location in RCRA Permit Application Page #
	Information in Part B Application	
270.14(b)(11) (iii) thru (v)	Location information related to 100 yr flood plain including variance demonstrations	154.8A
270.21(b)(2)	System for control of run-on from each peak discharge of 25 yr storm	155
270.21(b)(3)	System for control of run-off from 24 hr, 25 yr storm	159
270.17(b)(2)	Procedures/equipment to prevent overtopping	155
270.17(b)(3)	Structural integrity of dikes	155
	Additional Information	
	Discussion of surface-water uses within three miles of the unit, including a map showing the location of all surface-water bodies and downstream drinking water intakes	(424-425)
	Velocities of streams and rivers passing through and adjacent to the property	(425)

3. Surface Water Pathway (Continued)

Reg. Cite	Description	Page #
	Additional Information (continued)	
	Description of any system used to monitor surface-water quality, and a summary of the data	385-398 (425)
	Description of known releases to surface water; the extent of contamination; remedial action, if any; and if known, severity of impact.	369
	Any known food-chain contamination resulting from prior release from the unit to surface water	(425)

409

4. Air Pathway

Reg. Cite	Description	Location in RCRA Permit Application Page #
	Information in Part B Application	
270.14(b)(9), 270.21(f) and (g), 270.21(h) and (i)	Documentation of procedures to prevent accidental ignition or reaction	276
270.21(b)(5)	Plans to control wind dispersal of particulate matter at landfills	162.1A
270.14(b)(19)(v)	A wind rose showing prevailing windspeed and direction	154.6A
	Additional Information	
	Summary of air monitoring data and a description of current monitoring system, if any	(427)
	Population within a four mile radius of the unit	(427)
	Describe any known releases to air; the extent of contamination; remedial action, if any; and severity of impact, if known	(427)

APPENDIX A. INFORMATION REQUIREMENTS CHECKLIST

5. Subsurface Gas Pathway

Reg. Cite	Description	Location in RCRA Application Page #
	Information in Part B Application	
	None in addition to General Information Requirements	----------
	Additional Information	
	Any past disposal of municipal-type wastes in the unit; approximate quantities and dates of disposal, if known	Not Applicable (449)
	Map location of any underground conduits within the site and known underground conduits within 1000 feet of property boundary	154.6A
	Descriptions of any monitoring or control mechanisms for subsurface gas release; summmarize resulting data	Not Applicable (449)
	Description of any known releases; extent of contamination; remedial action taken, if any; and the severity of impact, if known	Not Applicable (449)

411

APPENDIX A. INFORMATION REQUIREMENTS CHECKLIST

6. Contaminated Soil Pathway

Reg. Cite	Description	Location in RCRA Permit Application Page #
	Information in Part B Application	
	None in addition to General Information Requirements	---------
	Additional Information	
	If soil sampling has been done, a map showing areas of soil contamination, and a summary of analytical results	369-401
	Description of the types of major releases that resulted in soil contamination, and any clean-up action	Not Applicable (450)
	Any known food-chain contamination resulting from the use of contaminated soils for raising crops	Not Applicable (450)

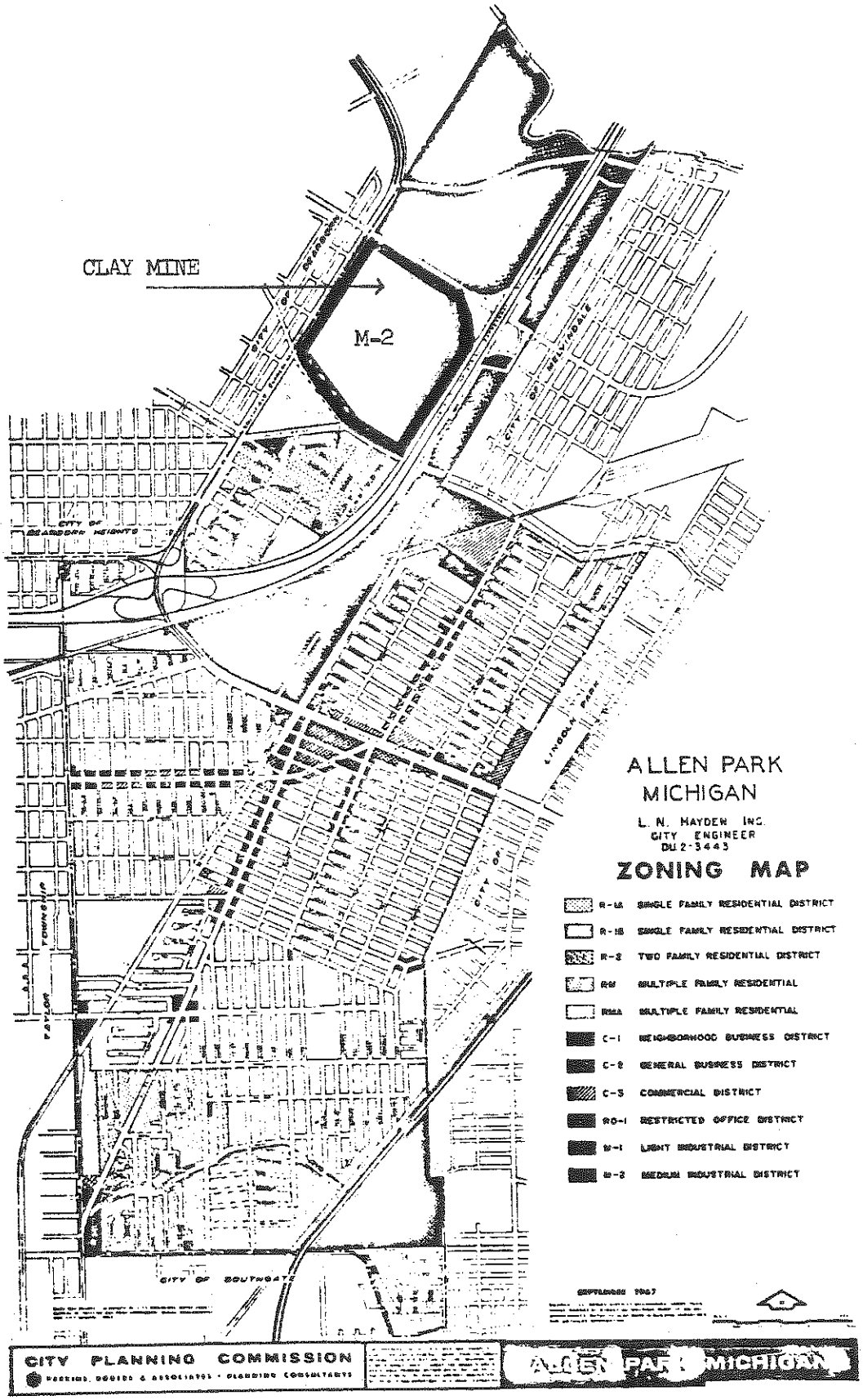
7. Transportation Information

Reg. Cite	Description	Location in RCRA Permit Application Page #
	Information in Part B Application	
270.14(b)(10)	Traffic pattern, volume, and controls; access road characteristics.	62A
	Additional Information	
	Description of the types and capacities of vehicles used to transport waste	(450)
	Identification of normal transport routes for hazardous waste into the site and within one mile of the facility entries	(450)
	Description of procedures for clean-up of transportation-related spills or leaks	(450)
	Descriptions of any transportation accidents releasing hazardous wastes on-site, or in the immediate vicinity	(451)

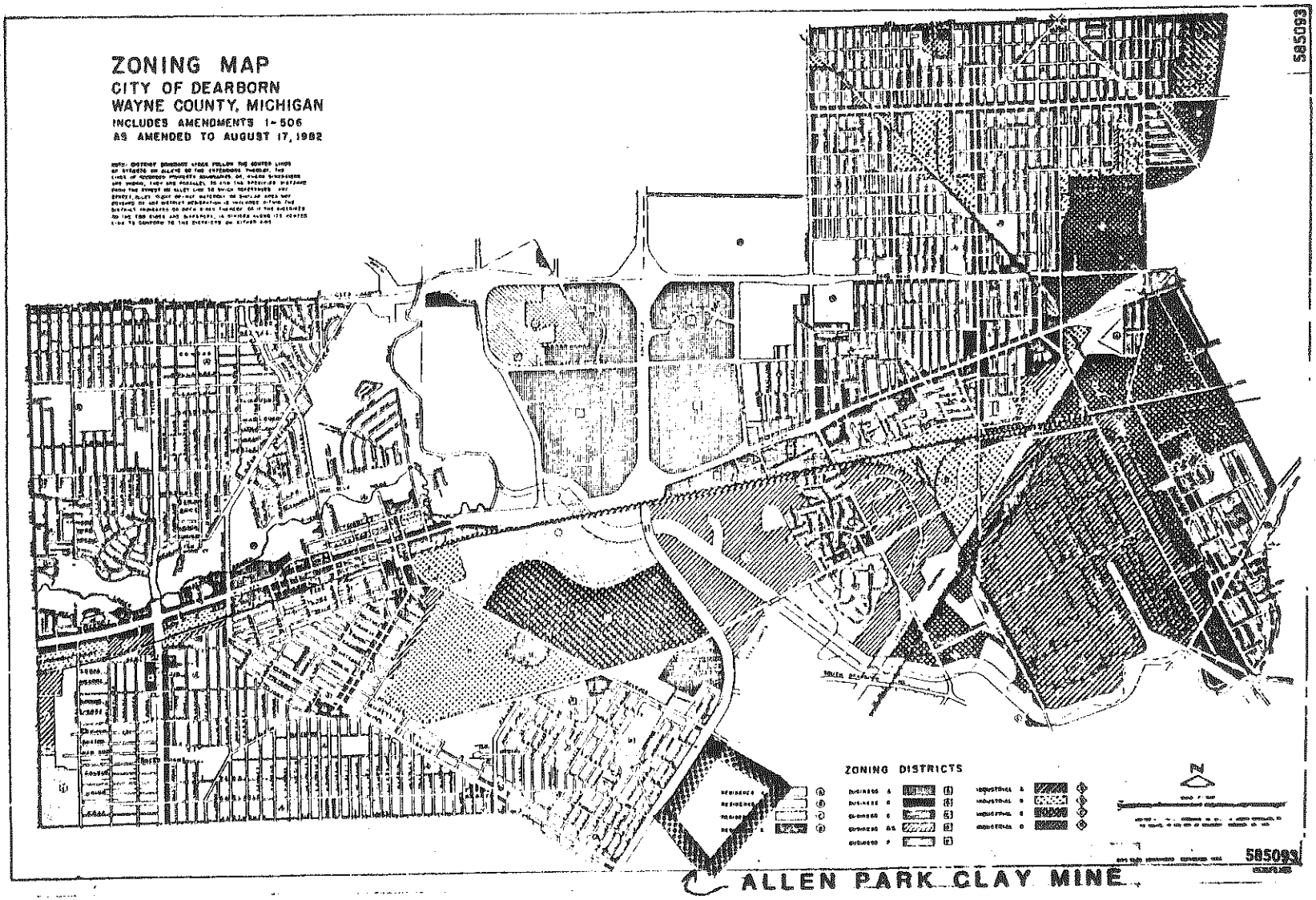
APPENDIX A. INFORMATION REQUIREMENTS CHECKLIST

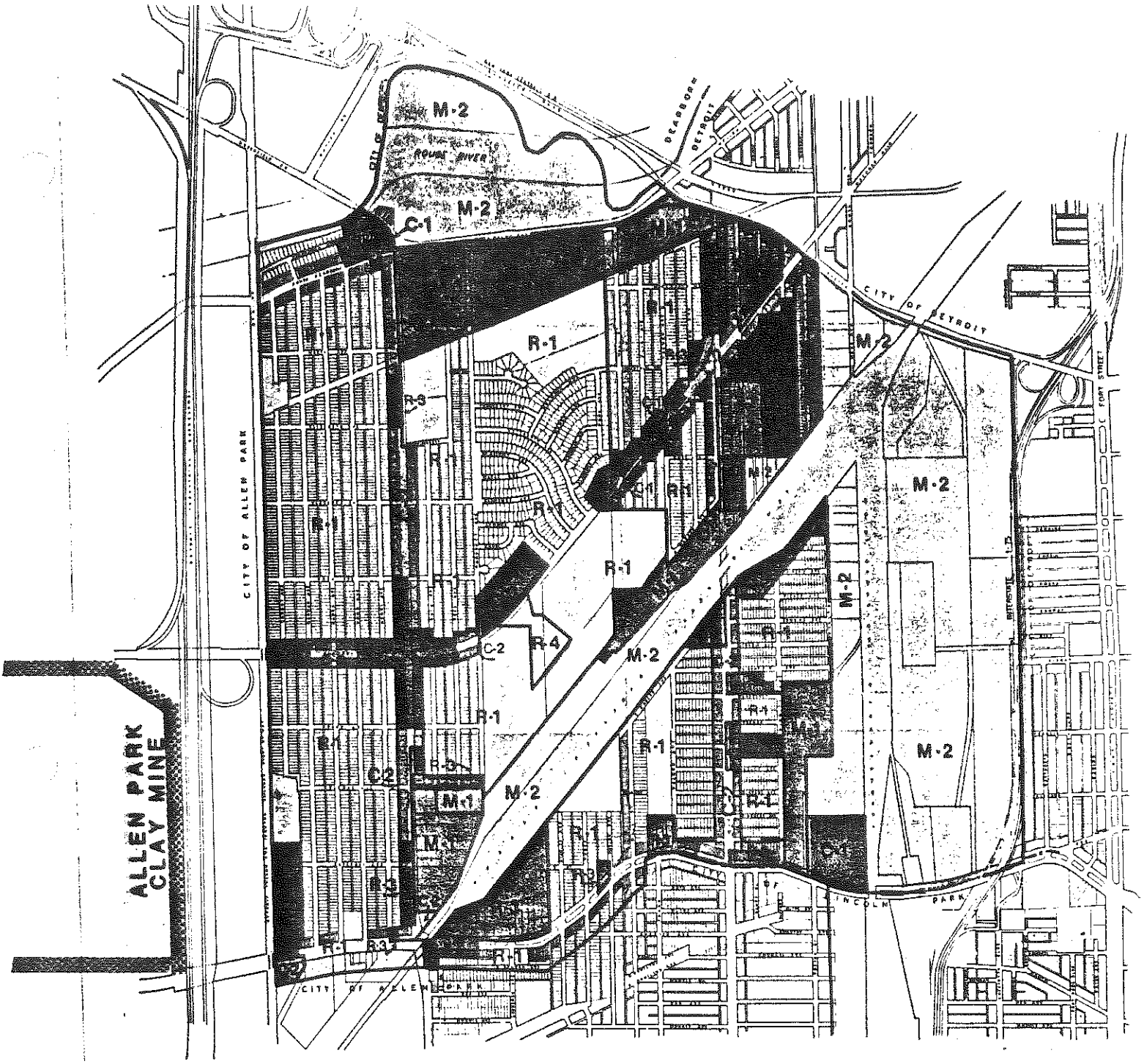
8. Management Practices Information

Reg. Cite	Description	Location in RCRA Permit Application Page #
	Information in Part B Application	
270.14(b)(12) 264.16	Outline of programs to train employees to safely operate and maintain facility, including emergency response activities	294
	Additional Information	
	Summary of existing records on worker illness or injury, related to the operation of the unit; include summaries of Workman's Compensation claims, or hospital records	(451)



FORD ALLEN PARK CLAY MINE
ZONING MAP


ZONING MAP
CITY OF DEARBORN
WAYNE COUNTY, MICHIGAN
INCLUDES AMENDMENTS 1-506
AS AMENDED TO AUGUST 17, 1982
585093
ZONING DISTRICTS
N
585093
ALLEN PARK CLAY MINE



ZONING MAP

R-1	ONE-FAMILY RESIDENTIAL	**PB-1**	PROFESSIONAL BUSINESS
R-2	TWO-FAMILY RESIDENTIAL	**C-1**	GENERAL SHOPPING
R-3	MULTIPLE-FAMILY RESIDENTIAL	**C-2**	GENERAL COMMERCIAL
R-4	MULTIPLE-FAMILY RESIDENTIAL	**M-1**	LIGHT MANUFACTURING
MHP	MOBILE HOME PARK	**M-2**	GENERAL MANUFACTURING

FEBRUARY 1981

Parkins / Rogers & Associates / Inc.
Planning Research & Environmental Design Consultants
Detroit

NORTH
SCALE 0 400 800 1200 1600 FEET

CITY OF MELVINDALE
WAYNE COUNTY, MICHIGAN


FORD MOTOR COMPANY
DEARBORN AREA

FORD MOTOR COMPANY

ALLEN PARK AREA

ALLEN PARK, MICHIGAN

DATE OF PHOTOGRAPHY
NOVEMBER 13, 1976

KUCERA

N

614

Allen Park Clay Mine -- MID 980 568 711
Leachate Analyses -- Hazardous Waste Cell I

DATE	PARAMETERS						
	Cd mg/l	Cr mg/l	Pb mg/l	Naphthalene ug/l	Phenol Method 4AAP mg/l	Phenol Method 604 ug/l	pH
4/13/84	<0.01	0.02	<0.05	<10	0.014	<10	
4/18/84	0.01	0.02	<0.05	<10	0.010	<10	
7/19/84	0.02	0.05	0.06	<10	0.090	<10	8.05
8/27/84	0.04	<0.02	0.11	<10	0.023	<10	
10/9/84	<0.01	<0.02	<0.05	<2	0.064	15	7.30
10/10/84	0.01	<0.02	0.08	<2	0.028	<2	7.90
10/11/84	0.01	<0.02	<0.05	<2	0.020	<2	7.96
10/12/84	0.02	<0.02	<0.05	<2	0.025	<2	8.09
10/15/84	<0.01	<0.02	0.10	<2	0.052	10	7.73
11/8/84	0.02	0.02	0.14	<10	0.14	<130	7.58
11/15/84	0.01	0.08	0.20	10	1.00	<390	7.42
11/16/84	0.01	0.03	0.14	18	0.15	<430	7.47
12/8/84	0.02	<0.02	<0.05	<10	0.61	<110	7.58
12/13/84	0.03	0.34	0.50	<12	3.3	<70	7.36
1/7/85	----	<0.02	<0.05	<10	3.8	<900	8.60
1/8/85	----	<0.02	<0.05	<15	3.4	<140	8.61
1/9/85	----	0.03	<0.05	<15	0.015	<200	8.56
1/10/85	----	0.03	<0.05	<48	2.8	<155	8.13
1/11/85	----	<0.02	<0.05	<14	2.7	<235	8.55
1/25/85	<0.01	0.03	<0.05	<64	2.24	<650	8.4
1/28/85	<0.01	0.04	<0.05	<66	2.03	<860	8.5
1/29/85	<0.01	0.06	<0.05	<13	0.69	<240	8.4
1/30/85	<0.01	0.18	0.17	<85	1.80	<750	8.5
4/15/85	0.02	0.12	0.42	<10	3.2	<770	8.07
4/15/85	0.02	0.10	0.33	<10	0.80	<300	8.11
4/30/85	0.01	0.24	0.48	<10	0.42	<25	8.39

Estimated Annual Volume of Waste

Waste Type	1981	1982	1983	1984	Future
F016	16,136	-	-	-	-
D005, D008	3,612	-	-	-	-
K061	6,259	469	60	223	19,074
K087	4,634	1,673	886	1,292	5,270
F006	-	-	-	-	20,000
D006	-	-	-	-	20,000
D007	-	-	-	-	20,000
D008	-	-	-	-	20,000
Total	30,641 yd.^{3}	2,142 yd.^{3}	946 yd.^{3}	1,515 yd.^{3}	104,344 yd.^{3}

Future waste volumes are based on maximum disposal rates.

Inspection Reports

Michigan DNR personnel perform annual RCRA inspections on behalf of the EPA as well as quarterly Act 64 inspections at the facility. Reports are available from:

Hazardous Waste Division
Michigan Department of Natural Resources
P. O. Box 30028
Lansing, Michigan 48909

A review of the alleged violations outlined in these reports reveal that most of the alleged deficiencies are procedural in nature. Examples include maintenance of training records, signage and inspection reports. The necessary corrective actions have been taken.

None of the alleged violations are considered major. In no case did the alleged deficiencies cited result in a release to the environment. The facility has not experienced any other regulatory agency inspections.

Potential for Human Exposure Via the Ground Water Pathway

The unit is located in an area of southeastern Michigan (Metropolitan Detroit) which has an extensive uniform lacustrine clay deposit that is 80-120 feet thick, underlain by Devonian carbonate formations whose artesian hydrostatic pressure extends upward through the overlying clay. Refer to pages 163-210 of the Part B license application for the discussion of the ideal hydrogeologic conditions which led to the facility groundwater monitoring waiver demonstration. Because the clay deposit is extensive and the underlying groundwater is highly mineralized, Detroit River/Lake Huron sources are the only water supplies used in the area for drinking or any other purpose. There are no groundwater withdrawal wells within three miles of the facility. The regional recharge is via the underlying artesian bedrock. Net precipitation is provided on page 122A of the Part B application. Refer to page 424 for the regional topographic map of the facility which extends out to a three mile radius.

The combination of a thick clay deposit with artesian conditions effectively prohibits the migration of leachate out of the cell. With installation of a double leachate collection system and double liner per the minimum technological requirements, the unit will have triple protection. In addition, run-on/run-off control systems minimize the potential for releases at the unit. Perimeter surface waters are monitored to identify any releases that might occur; thus, corrective action can be taken before human exposure occurs. There has been no food chain contamination due to any prior releases from the unit to groundwater, nor is there any well data indicating a release.


3 MILE RADIUS
ALLEN PARK CLAY MINE
DEARBORN
DEARBORN HEIGHTS
MELVINDALE
ALLEN PARK
LINCOLN PARK
TAYLOR
PROVING GROUND
Greenfield Village
Ford Museum
University of Michigan (Dearborn Campus)
Henry Ford Community College
Dearborn Country Club
ROUGE RIVER
FREEWAY
NORFOLK
WESTERN
Mapped, edited, and published by the Geological Survey in cooperation with State of Michigan agencies
Control by USGS, USC&GS, and City of Detroit
Planimetry by photogrammetric methods from aerial photographs
Topography by planetable surveys 1939. Revised from aerial photographs taken 1966-67. Field checked 1968
Polyconic projection. 1927 North American datum
CONTOUR INTERVAL 5 FEET
DATUM IS MEAN SEA LEVEL
QUADRANGLE LOCATION

424

Potential for Human Exposure Via the Surface Water Pathway

Refer to page 424 for the regional topographic map which shows the location of all surface water bodies within a three mile radius of the facility. The principal water body in this area is the Rouge River which is not commercially fished, used for agriculture, nor utilized recreationally. There are no drinking water intakes within a three mile radius. The facility is not located within the 100 year flood plain as indicated on page 154.8A of the Part B license application. Descriptions of the run-on/off control are on pages 155-162 of the application. Quality assurance and construction detail of the dikes is provided on page 154.8A of the application.

The closest bodies of surface water to the unit is the Allen Drain and Tyre Drain which originate on site. Refer to page 388 of the license application for the location of the drains in relation to the disposal cells. The drains have a flow velocity ranging from 0 to 84 cubic feet per second. The drains flow northeast after leaving the site and enter the Rouge River. Surface water in the drains have been sampled on a quarterly basis with the results presented on pages 385-398 of the Part B license application. Information concerning prior releases that may have occurred in the past relating to nearby solid waste operations is provided on pages 380-401 of the application. There has been no food chain contamination due to prior releases from the unit to surface water.

There are certain design and operating features which mitigate the potential for releases to surface waters such as:

1. Run-off control system - volumes of wastewater will be minimized and properly handled to prevent any releases.
2. Inspections - operators and supervisors perform routine inspections of the surface drains, leachate collection and discharge systems and run-on/off control systems to correct potential problems before releases can occur.
3. Training - operators are trained in the proper handling procedures of wastewater discharge, inspection procedures, equipment repair and waste handling.
4. Emergency procedures - operators are trained to respond to releases or potential releases from the unit by taking expeditious containment action.

Since surface waters are not used for drinking water in this area, and preventive and containment procedures are in place, there is a low potential for human exposure resulting from surface water releases.

Potential for Human Exposure Via the Air Pathway

The only pathway to human exposure from a release of the solid waste (particulates) at the facility is via fugitive air emissions. If contaminants from the facility became airborne, they could be carried into the neighborhood whereupon residents could be subject to inhalation of hazardous constituents. It is estimated that 125,000 people live within a four mile radius of the facility. The wastes are not reactive, volatile, ignitable or incompatible, however, they may include particulate matter susceptible to windblown conditions resulting in fugitive emissions, if they are not handled appropriately.

Various neighborhood organizations have participated in public hearings relating to the possible health and safety hazards at the facility as they relate to hazardous waste operations. As a result of such interest, the City of Dearborn required an analysis to address the question of whether there is an increased cancer incidence among residents of the community neighboring the disposal facility. The analysis prepared by the Biostatistics Unit of the Michigan Cancer Foundation, Division of Epidemiology is provided on pages 428-439, and concludes that there is insufficient evidence to support that residents of Snow Woods are at a higher risk of cancer because of their proximity with the Allen Park Clay Mine Landfill.

Air monitoring has been proposed for the facility to satisfy Michigan Act 64 permit requirements. The proposed plan is provided with this submittal on pages 440-442. Plans to control wind dispersal of particulate matter at the facility is provided on page 162.1A of the license application. The wind rose showing prevailing wind speed and direction is on page 154.6A of the application.

A fugitive dust control program has been proposed for the facility and is provided on pages 443-447. In order to assess the impact of potential fugitive emissions from the hazardous waste unit on the community, the model on page 448 was developed.

Snow Woods

Introduction

The Biostatistics Unit of the Michigan Cancer Foundation, Division of Epidemiology analyzed cancer incidence in the Snow Woods Neighborhood Area (1970 Census tracts 825.01 and 825.02) of the city of Dearborn at the request of the Dearborn Health Department. This project was completed as part of a larger study of the possible health and safety hazards posed by the Allen Park Clay Mine Landfill Hazardous Dump site which is adjacent to the Snow Woods Neighborhood. The analysis to be described addresses the question of whether there is an increased cancer incidence among residents of this neighborhood.

Methods

All cancer cases with the exception of non-melanoma skin cancers diagnosed between 1973 and 1981, by place of residence, were identified from the Michigan Cancer Foundation Cancer Surveillance System. Persons diagnosed with cancer while living within the 1970 census tracts 825.01 or 825.02 were taken to be Snow Woods cancer cases. There were 265 such cases, 264 of which were white and one black. The 4228 (4221 white and 7 black) Dearborn cancer cases consist of persons living within the City of Dearborn at the time of cancer diagnosis. 83,456 (59,614 white and 23,842 black) cancer cases were identified as living in Wayne County at the time of diagnosis and there were 130,948 (106,029 white and 24,919 black) cases identified in the tri-county area (Wayne, Oakland and Macomb counties). All persons identified were classified according to cancer site, age, race, and sex.

Snow Woods cancer cases were further classified according to street address. This was done so that the exact place of residence of each case could be plotted on a map of the Snow Woods neighborhood. The mapping procedure did not produce any clear results. Cancer cases were located around the perimeter of the two census tracts at the time of diagnosis. Fewer cases were found in the center part of both census tracts. This cancer distribution may be due to the distribution of family housing in these areas.

Using the 1973-1981 frequencies of cancer in the defined populations and population estimates for 1973-1981 (based on linear interpolation between the 1970 and 1980 census data for these areas) cancer incidence rates were calculated by age, sex and cancer site. Because there were so few blacks in Snow Woods, the nature of the census data precluded separating the Snow Woods population by race. The racial makeup of Dearborn is similar to that of Snow Woods so the Dearborn population was not stratified by race either. Both the Snow Woods and Dearborn populations have few blacks (1.25% and .09% black, respectively). For this reason, only the white Wayne County and white tri-county cancer incidence rates were used in the analysis.

The observed numbers of Snow Woods cancer cases (all races) were compared with the expected number of cases. The expected number of cancers was obtained by applying the cancer incidence rates in Dearborn (all races), Wayne County (whites) and the tri-county area (whites) to the Snow Woods population. This comparison was done by sex and age (<5, 5-9, 10-14, 15-19, 20-24, 25-34, 35-44, 45-54, 55-59, 60-64, 65-74, 75+) for each site group in which there was at least one Snow Woods cancer case.

Standard Morbidity Ratios (SMR's) were calculated for each age, sex and site group category and for all sites combined, as the ratio of the observed to expected number of cancers in Snow Woods; the ratio then multiplied by 100. A one-sided statistical test was used to determine whether the SMR was statistically significantly greater than 100 ($p<.05$). The one-sided test was used because only an excess of cancer in the Snow Woods community was of interest.

Results

Of the 31 site groups analyzed (including all sites combined) 25 showed no statistically significant excess of cancer cases. These sites include: all sites combined, colon, pancreas, lung and bronchus, female breast, cervix, corpus uteri, leukemia, buccal cavity and pharynx, esophagus, anus, gallbladder, other biliary sites (including bile ducts, ampulla of vater and biliary tract, NOS), larynx, soft tissue, skin melanoma, ovary, testis, bladder, kidney, other nervous system (including cranial nerve, spinal cord, cerebral and spinal meninges, and nervous system, NOS), thyroid, Hodgkin's lymphoma, non-Hodgkin's lymphoma, and ill-defined sites.

For those sites with at least one cancer in both sexes, a statistically significant ($p < .05$) excess of brain cancers among all persons (Table 1) was observed. While approximately 4 brain cancers were expected, (regardless of comparison group), 12 were observed, resulting in an SMR of approximately 300. For rectum, stomach and liver cancers, excesses were seen with two out of the three comparison groups. Analyses using tri-county whites and Dearborn residents resulted in significant excesses of cancer of the rectum and liver. In the case of stomach cancer, a significantly increased SMR was reported when comparisons were made with tri-county and

Wayne County whites. For all sites in which statistical significance was reached in at least one comparison group, SIRs were elevated (though not statistically significantly) regardless of comparison group.

Cancers in three site groups were found to be in excess only in males, however, the excesses were not seen consistently across all comparison groups. Cancers of the stomach and prostate in males were statistically significantly in excess ($p<.05$) when the expected number of cancers was calculated based on tri-county white and Wayne County white cancer incidence rates. Ten stomach cancers were observed while only about 4.5 were expected and 26 prostate cancers were observed while only about 17.4 were expected (Table 2). A statistically significant excess was not found for the same sites when the comparison was made based on Dearborn cancer incidence rates, however increases were found. Snow Woods males were also shown to have a statistically significant ($p<.05$) excess of multiple myeloma cases when compared with expected numbers calculated using Wayne County white cancer incidence rates (4 observed and 1.3 expected, an SMR of 300.3). An excess of soft tissue cancer cases was also observed, but only when the comparison group was Dearborn. Note that the numbers of observed cancers for these two sites are small.

Female residents of Snow Woods were shown to have an excess incidence of cancer of the liver (Table 1). This result was shown regardless of the comparison group used. While 3 liver cancers were observed among these women, only about 0.5 were expected, a statistically significant excess at $p<.05$.

The brain is the only cancer site for which both males and females were seen to have a statistically significant ($p < .05$) excess (Table 1). This excess is shown with all of the comparison populations used. Six brain cancer cases were observed among both the male and female residents of Snow Woods while only about 2 brain cancers were expected for each sex group. The excess occurred in the <5 and 25-34 year age groups for males and the 55-59 and 65-74 year age groups for females.

Discussion

It can be seen, from the results presented above, that the only statistically significant excess of cancer consistently found in the Snow Woods population is for brain cancer in both males and females and for liver cancer in females. Also shown in the above presentation is that statistical significance is influenced by the comparison group used in the analysis. It is important to note that expected values are calculated using incidence rates which are, in turn, based on population estimates for intercensal years. The reliablity of such an estimate may vary with the population under study. The accuracy of the incidence rates and, therefore, the expected numbers will depend on the accuracy of the population estimates. Further caution should be taken when interpreting these results because of the large number of statistical tests performed. Each test has a 5% probability of being rejected (resulting in a significant excess of cancers) by chance alone. The large number of statistical tests carried out further increases the possiblity that statistically significant SMRs occurred by chance.

The results presented do not take into account the length of residence in the Snow Woods neighborhood for each cancer case. This information is not available through the Cancer Surveillance System. Therefore, there is no assurance that cancer cases are long-term residents of the area of concern. Furthermore, long-term residents of this neighborhood who moved from these census tracts and subsequently developed cancer could not be identified. A number of other factors could not be controlled for in this analysis including cigarette smoking, alcohol use, and occupation, all of which may be related to cancer occurrence. For example, the development of liver cancer has been linked to hepatitis B virus, alcohol and aflatoxin exposures. (Schottenfeld and Fraumenie, Cancer Epidemiology and Prevention. W.B. Saunder Co., Philadelphia, 1982). Thus, it is impossible to implicate any one factor, such as the hazardous waste dump, as the causal factor resulting in the excess number of cancers on the basis of this investigation.

Studies have shown that systemic injection of certain chemicals into experimental animals results in a high incidence of nervous system tumors. These chemicals include N-nitrosamide, dialkylaryltriazenes, azo, azoxy and hydrazo compounds, and a polycyclic aromatic hydrocarbon. Epidemiologic investigations have reported an association between brain tumors and x-ray exposure, lead (in children), barbituates, work in rubber manufacturing and vinyl chloride exposure. (Schottenfeld and Fraumenie, Cancer Epidemiology and Prevention. W.B. Saunder Co., Philadelphia, 1982).

Based on the above results and discussion, there is insufficient evidence to conclude that the residents of the Snow Woods neighborhood are at a higher risk of cancer because of their association with the Allen Park

Riley Nine Landfill Hazardous Dump than residents of Dearborn, or white residents of either Wayne County or the entire tri-county area. However, the findings regarding the increased incidence of brain tumors in both sexes and of liver cancer in females may warrant further investigation.

Table 1

Observed and Expected Number of Cancers and Age-Adjusted SMR's
for Snow Woods by Sex, Site and Comparison Population
for those Sites with at Least One Cancer in Each Sex Group

	Total			Males			Females		
	OBS	EXP	SMR	OBS	EXP	SMR	OBS	EXP	SMR
All Sites									
Tri-County Whites	265	270.2	98.1	143	129.5	110.4	122	140.7	86.7
Wayne County Whites	265	270.3	98.0	143	131.0	109.1	122	139.3	87.6
Dearborn	265	271.3	97.7	143	127.2	112.4	122	144.0	84.7
Lung/Bronchus									
Tri-County Whites	43	42.4	101.3	32	30.6	104.5	11	11.8	93.2
Wayne County Whites	43	43.6	98.7	32	32.1	99.6	11	11.4	96.1
Dearborn	43	39.3	109.5	32	28.8	111.0	11	10.4	105.4
Colon									
Tri-County Whites	29	24.0	120.7	14	12.4	113.1	15	11.6	128.9
Wayne County Whites	29	23.4	124.1	14	11.9	117.9	15	11.5	130.5
Dearborn	29	26.8	108.2	14	14.1	99.4	15	12.7	117.9
Rectum/Rectosigmoid									
Tri-County Whites	19	12.2	156.0*	11	7.2	152.5	8	5.0	160.9
Wayne County Whites	19	12.5	151.8	11	7.5	147.4	8	5.1	158.0
Dearborn	19	12.1	157.6*	11	6.4	171.7	8	5.7	141.6
Stomach									
Tri-County Whites	13	6.6	198.5*	10	4.4	228.5*	3	2.2	138.3
Wayne County Whites	13	6.8	190.1*	10	4.7	214.6*	3	2.2	137.6
Dearborn	13	7.9	165.2	10	5.5	181.2	3	2.3	127.9
Brain									
Tri-County Whites	12	3.9	311.7*	6	2.1	283.6*	6	1.7	347.4
Wayne County Whites	12	4.0	301.5*	6	2.2	267.7*	6	1.7	345.4
Dearborn	12	4.2	287.1*	6	2.1	286.8*	6	2.1	287.8
Non-Hodgkin's Lymphoma									
Tri-County Whites	8	7.3	109.3	4	3.9	103.2	4	3.4	116.4
Wayne County Whites	8	6.9	115.6	4	3.6	111.0	4	3.3	120.9
Dearborn	8	7.5	107.1	4	4.3	93.6	4	3.2	124.9

Table 1 (Continued)

	Total			Males			Females		
	OBS	EXP	SMR	OBS	EXP	SMR	OBS	EXP	SMR
Pancreas									
Tri-County Whites	7	6.8	103.7	6	3.8	156.9	1	2.9	34.1
Wayne County Whites	7	6.8	102.6	6	3.9	154.7	1	2.9	34.0
Dearborn	7	5.7	122.8	6	3.1	195.3	1	2.6	38.1
Leukemia									
Tri-County Whites	6	7.1	84.6	3	4.2	70.9	3	2.9	104.8
Wayne County Whites	6	7.0	85.7	3	4.2	70.9	3	2.8	108.4
Dearborn	6	6.9	87.2	3	3.7	82.0	3	3.2	93.2
Ill-Defined Sites									
Tri-County Whites	6	8.0	75.0	2	4.1	48.7	4	3.9	102.9
Wayne County Whites	6	8.1	73.7	2	4.2	47.6	4	3.9	101.7
Dearborn	6	6.5	91.7	2	3.0	67.2	4	3.6	112.3
Buccal Cavity/Pharynx									
-County Whites	5	8.6	58.1	4	6.0	66.3	1	2.6	38.9
Wayne County Whites	5	9.4	53.2	4	6.7	59.4	1	2.7	37.6
Dearborn	5	6.8	73.1	4	4.7	85.8	1	2.2	45.9
Liver									
Tri-County Whites	4	1.4	296.3*	1	.9	111.2	3	.5	660.8*
Wayne County Whites	4	1.6	246.9	1	1.1	87.1	3	.5	638.3*
Dearborn	4	.9	434.8*	1	.6	180.8	3	.4	802.1*
Skin Melanoma									
Tri-County Whites	3	4.8	62.0	1	2.6	38.5	2	2.2	89.2
Wayne County Whites	3	4.1	74.1	1	2.1	47.2	2	1.9	103.8
Dearborn	3	4.1	73.4	1	2.0	49.3	2	2.1	97.1
Other Biliary									
Tri-County Whites	2	1.0	204.1	1	.5	190.5	1	.5	223.2
Wayne County Whites	2	1.1	190.5	1	.6	175.8	1	.5	206.6
Dearborn	2	1.0	206.2	1	.4	236.4	1	.5	183.5
Larynx									
i-County Whites	2	4.8	41.6	1	4.0	25.1	1	.8	122.6
Wayne County Whites	2	5.3	38.0	1	4.5	22.4	1	.8	123.6
Dearborn	2	3.0	66.9	1	2.3	44.3	1	.7	136.6

* SMR is significantly greater than 100 ($p<.05$)

Table 2

Observed and Expected Number of Cancers and Age-Adjusted SMR's for Snow Woods by Sex, Site and Comparison Population for Sex-Specific Sites and Sites with at Least One Observed Cancer in Males Only

	Males		
	OBS	EXP	SMR
Prostate			
Tri-County Whites	26	17.5	148.4*
Wayne County Whites	26	17.3	150.2*
Dearborn	26	20.3	127.9
Bladder			
Tri-County Whites	4	10.0	39.8
Wayne County Whites	4	9.8	41.0
Dearborn	4	8.8	45.3
Kidney			
Tri-County Whites	4	3.6	110.2
Wayne County Whites	4	3.6	111.7
Dearborn	4	2.6	155.8
Multiple Myeloma			
Tri-County Whites	4	1.5	266.7
Wayne County Whites	4	1.3	300.3*
Dearborn	4	1.7	240.7
Esophagus			
Tri-County Whites	3	2.1	145.1
Wayne County Whites	3	2.3	130.2
Dearborn	3	1.7	173.9
Soft Tissue			
Tri-County Whites	2	.6	363.0
Wayne County Whites	2	.6	333.3
Dearborn	2	.3	298.1
Hodgkin's Lymphoma			
Tri-County Whites	2	1.2	162.2
Wayne County Whites	2	1.1	178.9
Dearborn	2	1.6	127.6

Table 2 (Continued)

	Males		
	OBS	EXP	SMR
Gallbladder			
Tri-County Whites	1	.3	306.8
Wayne County Whites	1	.4	244.5
Dearborn	1	.3	326.8
Testis			
Tri-County Whites	1	1.1	87.8
Wayne County Whites	1	1.0	95.3
Dearborn	1	1.5	65.0

* SMR is significantly greater than 100 ($p < .05$)

Observed and Expected Number of Cancers and Age-Adjusted SMR's for Snow Woods by Sex, Site and Comparison Population for Sex-Specific Sites and Sites with at Least One Observed Cancer in Females Only

	Females		
	OBS	EXP	SMR
Breast			
Tri-County Whites	35	38.8	90.3
Wayne County Whites	35	37.8	92.6
Dearborn	35	44.2	79.2
Corpus Uteri			
Tri-County Whites	11	14.1	78.1
Wayne County Whites	11	12.8	85.9
Dearborn	11	15.8	69.6
Cervix			
Tri-County Whites	6	13.7	43.9
Wayne County Whites	6	14.3	42.1
Dearborn	6	10.8	55.8
Ovary			
Tri-County Whites	2	6.2	32.0
Wayne County Whites	2	5.2	38.5
Dearborn	2	5.3	37.4
Thyroid			
Tri-County Whites	2	2.3	86.2
Wayne County Whites	2	2.0	100.8
Dearborn	2	1.8	110.1
Anus			
Tri-County Whites	1	.4	255.8
Wayne County Whites	1	.4	255.1
Dearborn	1	.4	279.3
Other Nervous System			
Tri-County Whites	1	.1	917.4
Wayne County Whites	1	.1	1333.3
Dearborn	1	.3	302.1

Ford Motor Company

20001 Miller Road
Dearborn, Michigan 48121

November 28, 1984

Mr. Allen Greenberg
Air Pollution Control Division
Wayne County Health Department
1311 E. Jefferson Avenue
Detroit, MI 48207

Subject: Allen Park Clay Mine Air Monitoring Program

Dear Mr. Greenberg:

The attached program summary is proposed to satisfy Act 64 air monitoring requirements for the hazardous waste disposal facility at the Clay Mine. The program is based on Tom Shoens' October 30, 1984 recommendations letter and a November 9, 1984 meeting between Tom Shoens, Dave Miller of my office, and Ken Dowell of the Stationary Source Environmental Control Office.

If you have any questions on this program, please contact Mr. Kenneth I. Dowell at 322-1319.

Yours very truly,

Ben C. Trethewey

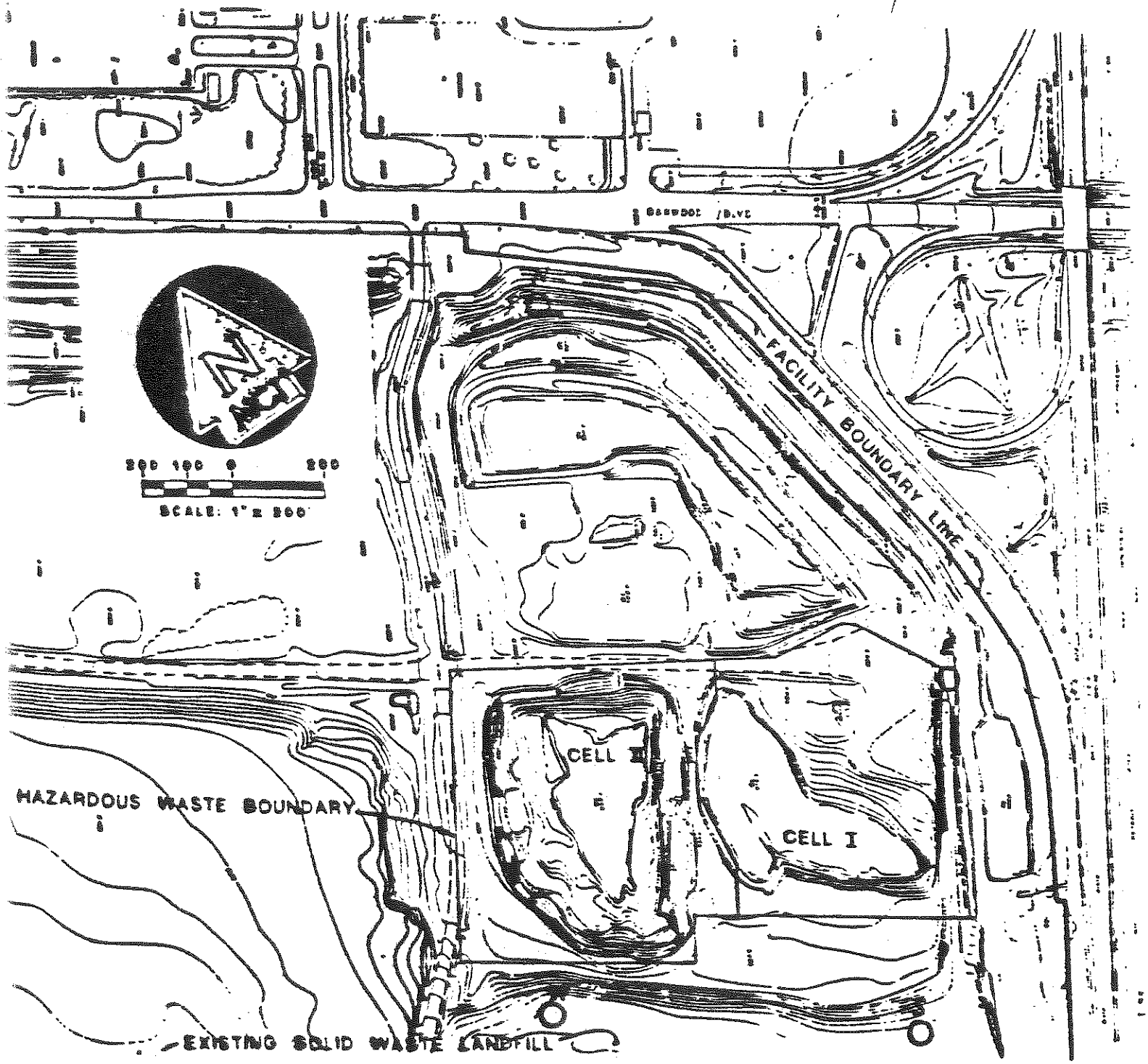
Ben C. Trethewey, Manager
Mining Properties Department

Attachments

cc: L. AuBuchon, MDNR
T. Shoens
D. Miller
V. H. Guzman

Fort Allen Park Clay Mine
Hazardous Waste Disposal Facility
Air Monitoring Program

○ High Volume Sampling Locations



Allen Park Clay Mine
Hazardous Waste Disposal Facility
Air Monitoring Program

Hardware

Four high-volume air samplers with flow rate controllers and well-type manometers.

Monitors located on disposal area perimeter as noted on attached plan.

Platforms to support each sampler 10 feet above ground.

Frequency

First quarter, once every third day, every other sample on NAMS Schedule.

Second, third, and fourth quarter, once every sixth day on NAMS Schedule.

Parameters

Routine analyses
- Total suspended particulate (TSP)
- Lead
- Chromium
- Cadmium

As Needed Basis
If TSP is greater than 150 $\mu g/m^3$ and there is active disposal of wastes which are hazardous due to metals content (e.g., Ni when and if F006 wastewater sludge is disposed)
- Hexavalent chromium (only if significant total chromium is present)
- Nickel
- Copper

Demonstration analyses for three selected sampling days during the first sampling month only
- Cyanide
- Phenols

Miscellaneous

Wind speed and direction will be determined locally, either on-site or at the new SSECO Office at Greenfield and Rotunda.

The samplers will be located, operated, calibrated, and audited according to applicable Federal regulations.

All filters and records pertaining to the study will be retained for two years.

Data will be reported quarterly and will be submitted during the month after each quarter.

11/14/84

Ford Motor Company

3001 Miller Road
Dearborn, Michigan 48121

July 17, 1985

Mr. Al Greenberg
Wayne County Health Department
Air Pollution Control Division
1311 East Jefferson
Detroit, Michigan 48207

Subject: Ford Allen Park Clay Mine
Fugitive Dust Control Program

Dear Mr. Greenberg:

Enclosed please find the subject facility's Fugitive Dust Control Program as required by the Michigan Air Pollution Control Commission Rule 336.1373.

Should you have any questions, please contact Mr. Joe Lennon at (313) 322-1227.

Yours very truly,

Ben C. Trethewey, Manager
Mining Properties Department

DSM:dp

Enclosures

bcc: Messrs. J. A. Esper
G. Kircos
R. P. Miller, MDNR
V. H. Sussman

Fugitive Dust Control Program

Ford Motor Company - Allen Park Clay Mine
17250 Oakwood Blvd.
Allen Park, Michigan 48120

Facility Operator:

Ben C. Trethewey

Telephone: (313) 594-2242

Room 2042, R.O.B.

3001 Miller Road

Dearborn, Michigan 48121

Facility Map:

Refer to Attachment I

Facility Description:

Site activities include: 1) 17 acre hazardous waste landfill

2) 9 acre non-hazardous solid waste landfill

3) 16 acre clay mining operation

Fugitive Dust Control Measures:

1) Hazardous Waste Landfill

Waste is covered daily to prevent waste materials from becoming airborne. Active truck dumping traffic areas are kept damp by daily spraying

Fugitive Dust Control Program (cont'd)

(weather permitting) using the water wagon to minimize fugitive dust emissions. The water wagon is available on a full time basis, and is utilized as needed, continually if required. Records of the water wagon usage are on file at the facility. Incoming particulate waste is watered down at the loading site to minimize potential fugitive dust emissions during the hauling, dumping and bulldozing stages.

2) Non-hazardous Landfill

Active work areas are restricted in size (no more than 3 acres) to limit exposure of waste materials to the wind. The active truck dumping traffic areas are kept damp by daily spraying (weather permitting) using the water wagon to minimize potential fugitive dust emissions. The water wagon is available on a full time basis, and is utilized as needed, continually if required. Records of the water wagon are on file at the facility. The incoming particulate waste is watered down at the loading site to minimize potential fugitive dust emissions during hauling, dumping, and bulldozing stages. The inactive work areas receive intermediate cover or other treatment (wetting or dust suppressant) to prevent the waste materials from becoming airborne. Areas where final grades for the land-filling activity are established, receive a clay cap and are seeded for vegetation.

3) Clay Mining Operation

Excavated clay is water saturated and loaded directly into the trucks for offsite transportation.

Fugitive Dust Control Program (cont'd)

4) Materials Handling and Transporting

As a landfill, the facility does not operate transportation equipment. However, certain operational procedures are employed to control potential fugitive dust emissions resulting from the trucking of waste materials:

a) Incoming particulate wastes are watered down at the loading site.

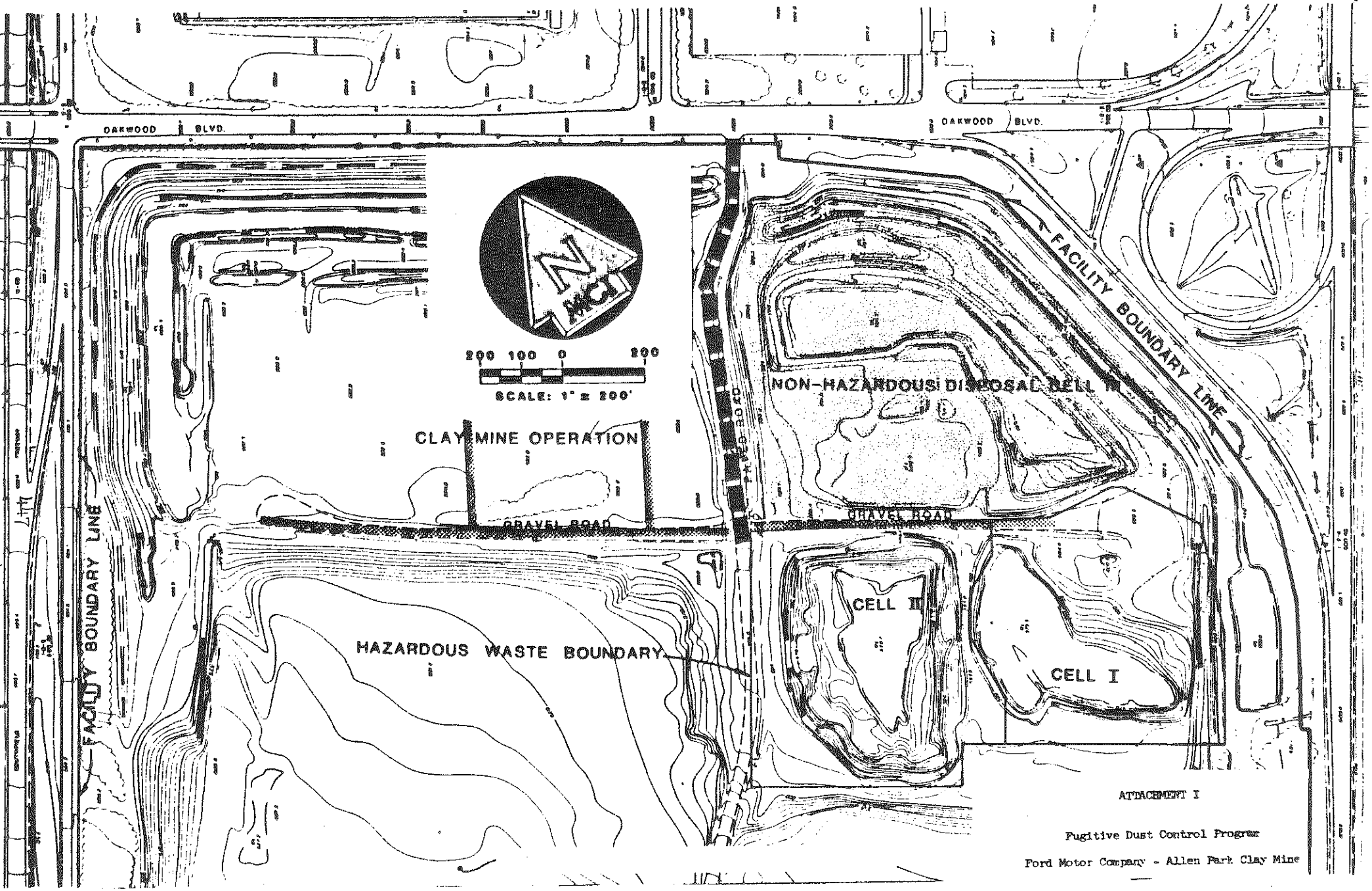
b) Open bed trucks with particulate wastes utilize covers to prevent loss of material while in transit.

c) Maximum speed limit signs are posted along the entrance road (15 mph).

5) Roads and Lots

a) A water wagon is employed (weather permitting) to keep the unpaved haul roads damp. The wagon is available on a full time basis and is utilized as needed. Records of the water wagon usage are on file at the facility. The unpaved haul roads are maintained using a road grader to remove accumulated mud and by applying a coarse aggregate (preferably 3x or 3A slag).

b) The entrance road to the facility is paved for a distance of 1,000 feet and kept clean by the use of a high pressure water spray on the water wagon.



ATTACHMENT I

Fugitive Dust Control Program

Ford Motor Company - Allen Park Clay Mine

ALLEN PARK CLAY MINE
FUGITIVE AIR EMISSION
ENVIRONMENTAL ASSESSEMENT

The ambient impact of fugitive dust from incoming material was assessed for a 24 hour period using traditional emission factors and manual dispersion estimating procedures. Key assumptions were:

> 200 tons/day of incoming wetted material
> material unloaded and spread over a 100 by 100 foot area
> storage pile is exposed for approximately 8 hours before daily capping

Recommended emission factors from "Report on Emission Factors Wayne County Nonattainment Study" 1984 by TRC (TRC Report No. 1800-L81-00) were used. The emission factor Q_u for unloading operations is .004608 lb/ton from the equation:

$$Q_u = \frac{.0018 * \frac{S}{5} * \frac{u}{5} * \frac{h}{10}}{(M/2)^{**2}} \quad \text{lb/ton}$$

Where:

S	Silt content (≤200 mesh)	50 %
u	Wind speed	20 mph
h	Drop height	4 ft.
M	Unbound moisture content %	5 %

The stationary pile emission factor Q_p is 32 lb/acre/hour from the equation:

$$Q_p = 1.6 * u \quad \text{lb/acre/hr}$$

Where:

u	Wind speed	20 mph

Downwind concentrations were estimated using "C" stability class and dispersion coefficients from "Workbook of Atmospheric Dispersion Estimates" by D. Bruce Turner (Publication NO. 999-AP-26, 1969).

The resulting 24 hour estimates are listed below. The total ambient impact at one kilometer downwind of the site is well below the primary particulate standard of 260 micrograms per cubic meter (TSP).

Downwind distance (km)	Unloading (ug/m^3)	Pile (ug/m^3)	Total (ug/m^3)
1	.027	1.73	1.76
2	.008	0.48	0.49
3	.004	0.24	0.24

Potential for Human Exposure from Subsurface Gas Release

Past disposal practice at the facility restricted acceptable waste materials to non-putrescible inert mineral waste. Refer to page 378 of the Part B license application for the waste types and quantities. Generation of gas is highly unlikely and there is an extremely low potential for a release of subsurface gas.

Potential for Human Exposure from Releases to Soil

Releases to the soil resulting from operations at the unit could potentially result from:

1. Fugitive emissions - Refer to page 427.
2. Off-site transport - Refer to page 450.
3. On-site transport - Trucks may spill their load which would trigger the spill clean-up procedures or truck tires and undercarriage may get covered with waste, and the truck may track waste out of the unit. Refer to pages 450-451.
4. Contaminated run-off - Refer to page 425 concerning surface waters.
5. Direct contact - Security procedures to limit public access to the unit are provided on pages 268-270 of the license application.

Soil sampling has consisted of sampling of bottom sediments in the surface drains, the results of which are provided in Section L pages 369-401 of the license application.

Crops are not grown adjacent to the facility so there is no potential for food chain contamination. There have been no major releases that resulted in soil contamination. The potential for human exposure resulting from soil contamination at or near the facility is very low.

Potential for Human Exposure from Transportation - Related Releases

Transportation of the incoming waste is via the Southfield Expressway or Interstate 94. The entrance to the facility is from Oakwood Blvd. No travel through residential areas is required. Refer to page 71 of the Part B license application for the transport route within the facility. As stated previously, the region is underlain with a thick clay bed and groundwater is not utilized for drinking water or other purposes. Surface waters within the three mile radius of the facility are not used for drinking water. Therefore, the potential for human exposure via groundwater and surface water is very low.

The transportation vehicles are required to be covered to prevent fugitive waste emissions while in transit. Clean-up procedures for transportation spills are as follows:

- Notify Ford Transportation and Technical Services (T&TS) supervision.
- T&TS will supply equipment (front loader, vacuum truck, shovels) and manpower to contain and clean up the spill.

The two types of transport units used to date are as follows:

- Five axle dump trucks with 24 $yd.^3$ capacity boxes.
- Single (rear) axle trucks with 5 $yd.^3$ capacity boxes.

Future transport units are likely to include 5-20 $yd.^3$ roll-off boxes.

A truck wheel wash is scheduled for construction which will mitigate any potential track out of waste from the facility.

To date, there have been no transportation spills involving hazardous waste in route to the facility.

Materials are unloaded at the fill area. Any spillage which might occur during unloading is placed in the landfill with equipment located on-site.

Potential for Human Exposure from Worker-Management Practices

There have been no reports of worker illnesses, accidents, or injuries related to the operation of the hazardous waste facility. The training program for the workers is designed to ensure safe handling of wastes and minimize the potential for releases at the facility. Description of the program begins on page 294 of the license application. One of the training requirements is that workers be familiar with contingency and emergency plans as described in the license application beginning on page 277.

Section N-
Environmental Monitoring

EXHIBIT A
FORD ALLEN PARK CLAY MINE
MID 980568711

ACT 64 SURFACE WATER MONITORING PROGRAM

A minimum of thirty (30) discrete grab samples shall be collected, using a dedicated Teflon^{R} bailer, pump, or organic-free glass container, at the Allen Drain, following a twenty-four hour rainfall of 0.5 inches or greater. The sampling location, downstream from the sediment pond, is identified on a map (Figure 1-A). Values established during this collection period shall constitute background levels for the facility surface waters. On the average, twenty (20) storm events exceeding 0.5 inches of precipitation, for the area, can be expected in a calendar year. The quantity of precipitation shall be recorded for each sampling event.

The parameters that shall be analyzed to establish background levels, including detection limits, container types and preservatives, holding times and analytical methods are listed in Tables 1, 2, and 3. Certain parameters from Table 3 (i.e., alkalinity, BOD, conductivity, and nitrate-N) might not be analyzed every time during the background monitoring period due to the short holding times for those parameters. Following the background monitoring period, parameters listed in Tables 1 and 2 shall be analyzed and evaluated statistically (Appendix VII of Section N) on the surface waters collected at the Allen drain. Samples shall be collected quarterly during foreground monitoring. Samples shall be preserved on ice, if refrigeration for storage is required, following collection.

Should a statistically significant increase be confirmed, the following procedure shall be implemented:

a. Evaluate Table 3 parameters for statistically significant increases and report the results.

b. Immediately implement a comprehensive surface water sampling program upstream of Allen Drain, and test for those parameters listed in Tables 1 and 2.

c. Determine, within 30 days of identifying a statistically significant increase over background, whether a discharge to surface waters is occurring or will occur during subsequent storm events.

d. Provide the Director, the Chief of the Waste Management Division or his designee a written report detailing those measures taken to prevent and eliminate any such discharge in the future.

Should the facility obtain a National Pollutant Discharge Elimination System (NPDES) permit for its surface drains, the Surface Water Monitoring Program identified herewithin shall be discontinued.

A Chain-of-Custody form shall be required whenever the contract laboratory is responsible for both sample collection and analysis; sampling protocol shall require sampling personnel to complete field data sheets, similar to those included as Appendices I, II, and III. Copies of these laboratory sheets shall be retained by the facility. Samples collected by anyone other than personnel from the contract laboratory shall be accompanied by a Chain-of-Custody form (Appendix VI). The Chain-of-Custody form shall accompany the samples and be signed and dated, by facility personnel, at the time the samples are released; the individual accepting the samples shall sign and date the same form acknowledging receipt of the samples.

A detailed laboratory QA/QC program is provided in Appendices IV and V.

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EXHIBIT B
FORD ALLEN PARK CLAY MINE
MID 980568711

ACT 64 SEDIMENT MONITORING PROGRAM

Four individual sediment core samples, spaced equally around the perimeter of the sediment pond, shall be collected semiannually for analysis. The sampling locations are identified, on a map of the sediment pond (Figure 1-B). A stainless steel core sampler shall be used to core samples to a depth of approximately six inches, at a distance of two feet from the existing shoreline. The core sampler shall be decontaminated between samples. All samples requiring organic analyses shall be preserved in a glass container having a Teflon^{R}-lined cap and returned to the laboratory.

The parameters that shall be analyzed, including detection limits, container types and preservatives, holding times and analytical methods are listed in Tables 4 and 5. The sample shall be placed on ice if refrigeration for storage is required.

Should the results indicate any of the tested parameters exist at levels which may pose a potential hazard to human health or the environment, the facility shall remove, dispose of the contaminated sediments in accordance with applicable state and federal regulations, and resample the sediments in the pond to verify environmentally safe levels have been attained. Should the sediments require removal due to contamination, a plan detailing those measures to be taken to prevent a recurrence of the problem shall be submitted.

A Chain-of-Custody form shall be required whenever the contract laboratory is responsible for both sample collection and analysis; sampling protocol shall require sampling personnel to complete field data sheets, similar to those included as Appendices I, II, and III. Copies of these laboratory sheets shall be retained by the facility. Samples collected by anyone other than personnel from the contract laboratory shall be accompanied by a Chain-of-Custody form (Appendix VI). The Chain-of-Custody form shall accompany the samples and be signed and dated, by facility personnel, at the time the samples are released; the individual accepting the samples shall sign and date the same form acknowledging receipt of the samples.

A detailed laboratory QA/QC program is provided in Appendices IV and V.

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EXHIBIT C
FORD ALLEN PARK CLAY MINE
MID 980568711

ACT 64 LEACHATE MONITORING PROGRAM

Discrete grab leachate samples, using dedicated Teflon^{R} bailers or pumps, shall be collected quarterly at Cell I and Cell II sumps. The volume of leachate discharged, monthly from each cell, to the sanitary sewer shall be metered and records shall remain on file at the facility office.

The parameters that shall be analyzed, including detection limits, container types and preservatives, holding times and analytical methods are listed in Tables 1, 2, and 6. The sample shall be preserved on ice, if refrigeration for storage is required.

A Chain-of-Custody form shall be required whenever the contract laboratory is responsible for both sample collection and analysis; sampling protocol shall require sampling personnel to complete field data sheets, similar to those included as Appendices I, II, and III. Copies of these laboratory sheets shall be retained by the facility. Samples collected by anyone other than personnel from the contract laboratory shall be accompanied by a Chain-of-Custody form (Appendix VI). The Chain-of-Custody form shall accompany the samples and be signed and dated, by facility personnel, at the time the samples are released; the individual accepting the samples shall sign and date the same form acknowledging receipt of the samples.

A detailed laboratory QA/QC program is provided in Appendices IV and V.

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EXHIBIT D

FORD ALLEN PARK CLAY MINE

MID 980 568 711

ACT 64 AIR MONITORING PROGRAM

An environmental consultant will be selected to operate the samplers and perform analyses. The parameters to be analyzed, sample collection and analysis procedures, detection limits, sampling frequency, methods used to determine precision and accuracy, hardware, recordkeeping, and data reports are described in Appendix VIII. Air sampling monitor locations are shown in Appendix IX. The air monitoring program is based on the MDNR "Ambient Air Monitoring Guidelines for Act 64 Facilities" dated March 22, 1985 and included as Appendix X.

EXHIBIT E
FORD ALLEN PARK CLAY MINE
MID 980568711

ACT 64 SOIL MONITORING PROGRAM

Six individual soil core samples shall be collected, during each sampling event, from the shoulders of the facility entrance road, between the Truck Wheel Wash exit and Oakwood Boulevard (i.e., three samples to be collected from each roadway shoulder). The sampling locations are identified on a map of the facility entrance road (Figure 1-E). A minimum of thirty (30) discrete samples shall be collected for background monitoring. Six individual soil samples shall be collected annually thereafter during foreground monitoring. A steel core sampler shall be used to core samples to a depth of approximately three inches, at a distance of approximately three feet off the roadway, every 200-250 feet along the shoulders of the road. The core sampler shall be decontaminated between samples. All samples requiring organic analyses shall be preserved in a glass container having a Teflon^{R}-lined cap and returned to the laboratory. Should the facility, at some time in the future, curb, gutter, and sewer the run-off from the entrance road, the Soil Monitoring Program identified herewithin shall be discontinued.

The parameters that shall be analyzed to establish background levels, including detection limits, container types and preservatives, holding times and analytical methods are listed in Tables 4 and 5. Samples shall be collected annually during foreground monitoring. The samples shall be preserved on ice, if refrigeration for storage is required.

Should a statistically significant increase be confirmed, the facility shall remove and dispose of the contaminated soils in accordance with applicable state and federal regulations, and resample the soils along the road to verify environmentally safe levels have been attained. Should the soils require removal due to contamination, a plan detailing those measures to be taken to prevent a recurrence of the problem shall be submitted.

A Chain-of-Custody form shall be required whenever the contract laboratory is responsible for both sample collection and analysis; sampling protocol shall require sampling personnel to complete field data sheets, similar to those included as Appendices I, II, and III. Copies of these laboratory sheets shall be retained by the facility. Samples collected by anyone other than personnel from the contract laboratory shall be accompanied by a Chain-of-Custody form (Appendix VI). The Chain-of-Custody form shall accompany the samples and be signed and dated, by facility personnel, at the time the samples are released; the individual accepting the samples shall sign and datD the same form acknowledging receipt of the samples.

A detailed laboratory QA/QC program is provided in Appendices IV and V.

EXHIBIT F
FORD ALLEN PARK CLAY MINE
MID 980568711

ACT 64 LEAK DETECTION MONITORING PROGRAM

Water that drains to the leak detection system shall be collected at the individual monitoring sumps as a grab sample, using a dedicated Teflon^{R} bailer or pump. The monthly volumes of collected waters, to be discharged to the sanitary sewer, shall be recorded and records shall remain on file at the facility office.

A minimum of four samples (to be sampled quarterly provided a sufficient aliquot of water can be collected) shall be collected at each sump once construction of such sump is completed. Values established during this collection period shall constitute background levels for the water in the leak detection system.

The parameters that shall be analyzed while establishing background levels, including detection limits, container types and preservatives, holding times and analytical methods are listed in Tables 1, 2, and 6. Following the background monitoring period, parameters listed in Tables 1 and 2 shall be analyzed and evaluated statistically (Appendix VII of Section N) on any waters collected in the leak detection monitoring sumps. Samples shall be collected quarterly during foreground monitoring, provided a sufficient aliquot of sample can be obtained. Samples shall be preserved on ice, if refrigeration for storage is required.

Should a statistically significant increase be confirmed, the following procedure shall be implemented:

a. Notify the Director immediately by calling the Chief of the Waste Management Division, the Waste Management Division District Supervisor, or Department of Natural Resources 24 hour emergency response telephone at 1-800-292-4780, and by providing follow-up notification to the Chief of the Waste Management Division in writing within seven (7) days.

b. Begin immediate action to implement the facility contingency plan.

c. Provide the Chief of the Waste Management Division or his designee, with weekly telephone updates and written reports every two (2) weeks regarding the progress to date in determining the cause of contamination, and the results of all samples from environmental monitoring conducted at the facility.

d. Evaluate Table 6 parameters for statistically significant increases and report the results.

e. Determine, within 30 days of notification, the cause of contamination to the leak detection system and whether a failure in the liner system has occurred. A plan shall be submitted in writing, certified by a registered professional engineer, detailing one of the following:

   i. documentation certifying that a liner failure has not occurred or will not result in contamination of groundwater; or

   ii. documentation certifying those measures that have been taken or that will be taken to repair the primary liner system; or

   iii. documentation certifying those measures that have been taken or that will be taken to provide protection against groundwater contamination.

A Chain-of-Custody form shall be required whenever the contract laboratory is responsible for both sample collection and analysis; sampling protocol shall require sampling personnel to complete field data sheets, similar to those included as Appendices I, II, and III. Copies of these laboratory sheets shall be retained by the facility. Samples collected by anyone other than personnel from the contract laboratory shall be accompanied by a Chain-of-Custody form (Appendix VI). The Chain-of-Custody form shall accompany the samples and be signed and dated, by facility personnel, at the time the samples are released; the individual accepting the samples shall sign and date the same form acknowledging receipt of the samples.

A detailed laboratory QA/QC program is provided in Appendices IV and V.

EXHIBIT G
FORD ALLEN PARK CLAY MINE
MID 980568711
POTENTIOMETRIC MONITORING PLAN

Although a groundwater monitoring waiver has been granted under R199.9611(3)(b); monitoring of the static water levels at the site will be maintained to verify the continued existence of the waiver conditions. If this monitoring determines that conditions have changed, and that monitoring is warranted, requirements under R299.9611(2)(a), R299.9612 and R299.9506(3)(4) or (5) must be met, as well as 40 CFR part 264, subpart F.

Static water level measurements should be taken annually on wells 5D, 102D and 103D, which are located on Figure 1-G. These wells are under artesian conditions and are outfitted as shown in Figure 2-G. Such a system includes a well plug incorporating a sampling valve. The plug seals the well approximately 2½ feet below grade level to prevent freezing during winter months. The well plug and valve are constructed entirely of stainless steel with silicone rubber seals. The valve is used to measure the water level via a staff gauge and precision pressure gauge and is also used to purge the well and obtain the groundwater sample. Samples should not be taken during the winter months in order to avoid problems that might result from excessive frost penetration.

The monitoring well 103D was constructed using 2-inch, threaded, schedule 40 PVC pipe. Upon completion of the soil boring, a five foot slotted PVC well screen (slot size - 0.01 inch) was attached to the bottom of the PVC standpipe and lowered to the bottom of the borehole within the sand and hardpan layers. A pea gravel pack was constructed around the entire length of the screen and a bentonite seal (approximately 2 feet thick) placed over the gravel pack within the borehole to prevent seepage from above.

The borehole was then backfilled with the clay spoil from the boring operation to the surface with a two-foot bentonite seal placed at a depth of approximately 15 feet. Five-inch diameter steel casing was placed over the standpipe and grouted in place to a depth of about four feet below grade to protect the PVC standpipe. Locking caps were provided to reduce the potential for vandalism. A typical cross section of the well construction is shown on Figure 3-G.

Upon completion of the well installation, the wells were developed by flushing (with clean water) any soil fines or other foreign material from within the well casing. Subsequently, the well casing, ground surface and ground water elevations were determined at each well. Well 5D consisted of 2-inch diameter #80 gauge well points with 2-inch diameter galvanized riser pipe. Well construction was similar to that of well 103D as shown on Figure 3-G.

EXHIBIT G
FORD ALLEN PARK CLAY MINE
STATIC WATER ELEVATION PROCEDURES

The procedure for obtaining static water elevations from the outfitted artesian wells are as follows:

1. The stainless steel ball valve is opened, allowing groundwater to flow from the system. Once water is observed discharging from the well plug device, the ball valve is closed.
2. A 4-foot length of Tygon tubing is attached to the closed discharge valve on the well plug system. The other end of the Tygon tubing is attached to an inlet valve on a Wallace and Tiernan Series 1000 Pressure Gauge. The pressure gauge is calibrated to read 0-125 inches of water.
3. The discharge valve on the well plug system is opened, allowing water to rise in the Tygon tubing.
4. A temporary staff gauge is used to measure the height of the water in the Tygon tubing and referenced to the top of the well casing.
5. The reading from the pressure gauge is added to the inches of water measured in the Tygon tubing, representing the total inches of water above the casing.
6. The final static water elevation is derived by converting the total inches of water above the casing to feet and adding the known USGS casing elevation (recorded in feet) of the well.

EXHIBIT H
FORD ALLEN PARK CLAY MINE
MID 980568711

ACT 64 LYSIMETER MONITORING PROGRAM

One sample, from each lysimeter, shall be collected semiannually for analysis provided a sufficient aliquot of sample can be obtained. Two lysimeters shall be located in the area between the Sedimentation Pond and the southern perimeter dike of Cell I as identified in Figure 1-H. The lysimeters shall be placed at an elevation of 560 msl for the monitoring of in situ saturated clays adjacent to Cell I, pursuant to R299.9611(5).

A schematic of a typical lysimeter, to be constructed, is presented in Figure 2-H. The vacuum-pressure lysimeter shall be constructed of virgin Teflon^{R} and of equivalent design to the lysimeter presented in Figures 3-H and 4-H. Equivalent procedures for lysimeter installation and sampling are presented in Figures 5-H and 6-H, respectively.

The parameters that shall be analyzed, including detection limits, container types and preservatives, holding times and analytical methods are listed in Table 2. Waters that are collected shall be analyzed and evaluated statistically (Appendix VII of Section N). Background values for those parameters listed in Table 2 shall be assumed to be below detection limit (BDL) since no background data will be collected for the Lysimeter Monitoring Program (i.e., the first sampling shall begin foreground Monitoring). The sample shall be preserved on ice, if refrigeration for storage is required.

Should a statistically significant increase be confirmed, the following procedure shall be implemented:

a. Notify the Director immediately by calling the Chief of the Waste Management Division, the Waste Management Division District Supervisor, or Department of Natural Resources 24 hour emergency response telephone at 1-800-292-4780, and by providing follow-up notification to the Chief of the Waste Management Division in writing within seven (7) days.

b. Begin immediate action to implement the facility contingency plan.

c. Provide the Chief of the Waste Management Division or his designee, with weekly telephone updates and written reports every two (2) weeks regarding the progress to date in determining the cause of contamination, and the results of all samples from environmental monitoring conducted at the facility.

d. Resample immmediately and analyze for those parameters in Tables 1 and 6. Construct Stiff diagrams, using parameters from Tables 1 and 6, and compare lysimeter waters to those of Cell I leachate.

e. Determine, within 30 days of notification, the cause of contamination to the leak detection system and whether a failure in the liner system has occurred. A plan shall be submitted in writing, certified by a registered professional engineer, detailing one of the following:

   i. documentation certifying that a liner failure has not occurred or will not result in contamination of groundwater; or

   ii. documentation certifying those measures that have been taken or that will be taken to repair the primary liner system; or

   iii. documentation certifying those measures that have been taken or that will be taken to provide protection against groundwater contamination.

A Chain-of-Custody form shall be required whenever the contract laboratory is responsible for both sample collection and analysis; sampling protocol shall require sampling personnel to complete field data sheets, similar to those included as Appendices I, II, and III. Copies of these laboratory sheets shall be retained by the facility. Samples collected by anyone other than personnel from the contract laboratory shall be accompanied by a Chain-of-Custody form (Appendix VI). The Chain-of-Custody form shall accompany the samples and be signed and dated, by facility personnel, at the time the samples are released; the individual accepting the samples shall sign and date the same form acknowledging receipt of the samples.

A detailed laboratory QA/QC program is provided in Appendices IV and V.

TABLE 1
Section N
Environmental Monitoring

Parameter	Analytical Method[1]	Detection Limit	Container & Preservative	Holdin Time
Arsenic	3010 + (6010 or 7061)	(ICP) 0.005 mg/l	P, G, N	6 mos
Barium	3010 + (6010 or 7080)	(ICP) 0.05 mg/l	P, G, N	6 mos
Cadmium	3010 + (6010 or 7130)	(ICP) 0.01 mg/l	P, G, N	6 mos
Chromium	3010 + (6010 or 7190)	(ICP) 0.02 mg/l	P, G, N	6 mos
Copper	3010 + (6010 or 7210)	(ICP) 0.02 mg/l	P, G, N	6 mos
Lead	3010 + (6010 or 7420)	(ICP) 0.05 mg/l	P, G, N	6 mos
Mercury	7470	0.0005 mg/l	P, G, N	28 day
Nickel	3010 + (6010 or 7520)	(ICP) 0.015 mg/l	P, G, N	6 mos
Selenium	3010 + (6010 or 7741)	(ICP) 0.005 mg/l	P, G, N	6 mos
Silver	3010 + (6010 or 7760)	(ICP) 0.02 mg/l	P, G, N	6 mos
Zinc	3010 + (6010 or 7950)	(ICP) 0.02 mg/l	P, G, N	6 mos

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1 "Test Methods for Evaluating Solid Waste" SW-846, Third Edition
P: Plastic
G: Glass
N: Nitric acid to pH < 2

permit.tbl

TABLE 2
Section N
Environmental Monitoring

Parameter	Analytical Method[1]	Detection Limit	Container & Preservative	Holding Time
SCAN 7	(3510 or 3520) + 8100	0.01 mg/l	G, T, R	E
SCAN 8	(3510 or 3520) + 8040	0.01-0.02 mg/l	G, T, R	E

SCAN 7 - Polynuclear Aromatic Hydrocarbons

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(ghi)perylene
Benzo(a)pyrene
Chrysene
Dibenzo(a/h)anthracene
Fluoranthene
Fluorene
Ideno(1,2,3-cd)pyrene
Naphthalene
Phenanthrene
Pyrene

SCAN 8 - Phenolics

2-Chlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
4,6-Dinitro-o-cresol
2,4-Dinitrophenol
2-Nitrophenol
4-Nitrophenol
p-Chloro-m-cresol
Pentachlorophenol
Phenol
2,4,6-Trichlorophenol
2,4,5-Trichlorophenol

1 "Test Methods for Evaluating Solid Waste" SW-846, Third Edition
G: Glass
T: Teflon^{R}-lined cap
R: Refrigeration
E: 7 days to extraction and 40 days from collection

TABLE 3
Section N
Environmental Monitoring

Parameter	Analytical Method[1]	Detection Limit		Container & Preservative	Holding Time
Iron	3010 + (6010 or 7380)	(ICP) 0.02	mg/l	P, G, N	6 mos.
Alkalinity	310.1[a]	10	mg/l	P, G, R	24 hrs.
Carbonate	403[b]	1	mg/l	P, G, R	14 days
Bicarbonate	403[b]	1	mg/l	P, G, R	14 days
Chlorides	407A[b]	1	mg/l	P, G	28 days
Sulfate	9038	1	mg/l	P, G, R	28 days
Nitrate-N	353.2[a]	0.02	mg/l	P, G, R	48 hrs.
Ammonia-N	350.1[a] or 350.2[a]	0.05	mg/l	P, G, A, R	28 days
Conductivity	9050	N/A		P, G, R	24 hrs.
pH	9040	N/A		N/A	D
Cyanide	9010	0.02	mg/l	P, G, S	14 days
BOD	405.1[a]	5	mg/l	P, G	24 hrs.
COD	410.1[a] or 410.2[a]	1	mg/l	P, G, A, R	28 days
TOC	9060	1	mg/l	P, G, A, R	28 days
Phenolics	9065	0.002	mg/l	G, T	28 days

---

1 "Test Methods for Evaluating Solid Waste" SW-846, Third Edition
a "Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79-020, March 1979
b "Standard Methods for the Evaluation of Water and Wastewater", Sixteenth Edition
P: Plastic
G: Glass
R: Refrigeration
T: Teflon^{R}-lined cap
N: Nitric acid to pH < 2
A: Sulfuric acid to pH < 2
D: Determine on site
S: Sodium hydroxide to pH > 12

permit.tb3

TABLE 4
Section N
Environmental Monitoring

Parameter	Analytical Method[1]	Detection Limit		Container & Preservative	Holding Time
Arsenic	3010 + (6010 or 7061)	(ICP) 0.3	mg/kg	P, G, R	6 mos.
Barium	3010 + (6010 or 7080)	(ICP) 1.25	mg/kg	P, G, R	6 mos.
Cadmium	3010 + (6010 or 7130)	(ICP) 0.5	mg/kg	P, G, R	6 mos.
Chromium	3010 + (6010 or 7190)	(ICP) 0.8	mg/kg	P, G, R	6 mos.
Copper	3010 + (6010 or 7210)	(ICP) 0.5	mg/kg	P, G, R	6 mos.
Lead	3010 + (6010 or 7420)	(ICP) 2.5	mg/kg	P, G, R	6 mos.
Mercury	7470	0.02-0.03	mg/kg	P, G, R	28 days
Nickel	3010 + (6010 or 7520)	(ICP) 1.5	mg/kg	P, G, R	6 mos.
Selenium	3010 + (6010 or 7741)	(ICP) 0.3	mg/kg	P, G, R	6 mos.
Silver	3010 + (6010 or 7760)	(ICP) 0.5	mg/kg	P, G, R	6 mos.
Zinc	3010 + (6010 or 7950)	(ICP) 0.5	mg/kg	P, G, R	6 mos.

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1 "Test Methods for Evaluating Solid Waste" SW-846, Third Edition
P: Plastic
G: Glass
R: Refrigeration

permit.tb4

TABLE 5
Section N
Environmental Monitoring

Parameter	Analytical Method[1]	Detection Limit	Container & Preservative	Holdin Time
Naphthalene	(3540 or 3550) + 8100	10 mg/kg	G, T, R	E
Phenol	(3540 or 3550) + 8040	10 mg/kg	G, T, R	E
Cyanide	9010[a]	1 mg/kg	P, G, R	7 day

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1 "Test Methods for Evaluating Solid Waste" SW-846, Third Edition
a "Test Methods for Evaluating Solid Waste" SW-846, Second Edition
P: Plastic
G: Glass
T: Teflon^{R}-lined cap
R: Refrigeration
E: 7 days to extraction and 40 days from collection

permit.tb5

TABLE 6
Section N
Environmental Monitoring

Parameter	Analytical Method[1]	Detection Limit		Container & Preservative	Holding Time
Iron	3010 + (6010 or 7380)	(ICP) 0.02	mg/l	P, G, N	6 mos
Alkalinity	310.1[a]	10	mg/l	P, G, R	24 hrs
Carbonate	403[b]	1	mg/l	P, G, R	14 days
Bicarbonate	403[b]	1	mg/l	P, G, R	14 days
Chlorides	407A[b]	1	mg/l	P, G	28 days
Sulfate	9038	1	mg/l	P, G, R	28 days
Conductivity	9050	N/A		P, G, R	24 hrs
pH	9040	N/A		N/A	D
Cyanide	9010	0.02	mg/l	P, G, S	14 days
BOD	405.1[a]	5	mg/l	P, G	24 hrs
COD	410.1[a] or 410.2[a]	1	mg/l	P, G, A, R	28 days
TOC	9060	1	mg/l	P, G, A, R	28 days
Phenolics	9065	0.002	mg/l	G, T	28 days

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1 "Test Methods for Evaluating Solid Waste" SW-846, Third Edition
a "Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79-020, March 1979
b "Standard Methods for the Evaluation of Water and Wastewater", Sixteenth Edition
P: Plastic
G: Glass
R: Refrigeration
T: Teflon^{R}-lined cap
N: Nitric acid to pH < 2
A: Sulfuric acid to pH < 2
D: Determine on site
S: Sodium hydroxide to pH > 12

permit.tb6

FIGURE 1-A

Section N
Environmental Monitoring

Ford Allen Park Clay Mine

BENCH MARK NOTE

ELEVATIONS INDICATED HEREON RELATE TO USGS DATUM

BM F-33 EL 595.75

WAYNE COUNTY ROAD COMMISSION BRONZE TABLET IN BRIDGE CONCRETE SIDEWALK, SOUTHWESTERLY CORNER OF OAKWOOD BOULEVARD - SOUTHFIELD FREEWAY BRIDGE.

LEGEND

POLE o
LIGHT oL
SIGN /S oS
FENCE ——x——
CULVERT) (
CONTOURS 600 610
TRANSMISSION TOWER ⊠
WATER LEVEL WL 589.5
TREE & TIMBER

ELEVATIONS OBTAINED BY GROUND SURVEY
CONTOUR INTERVAL - 2 FT.

N

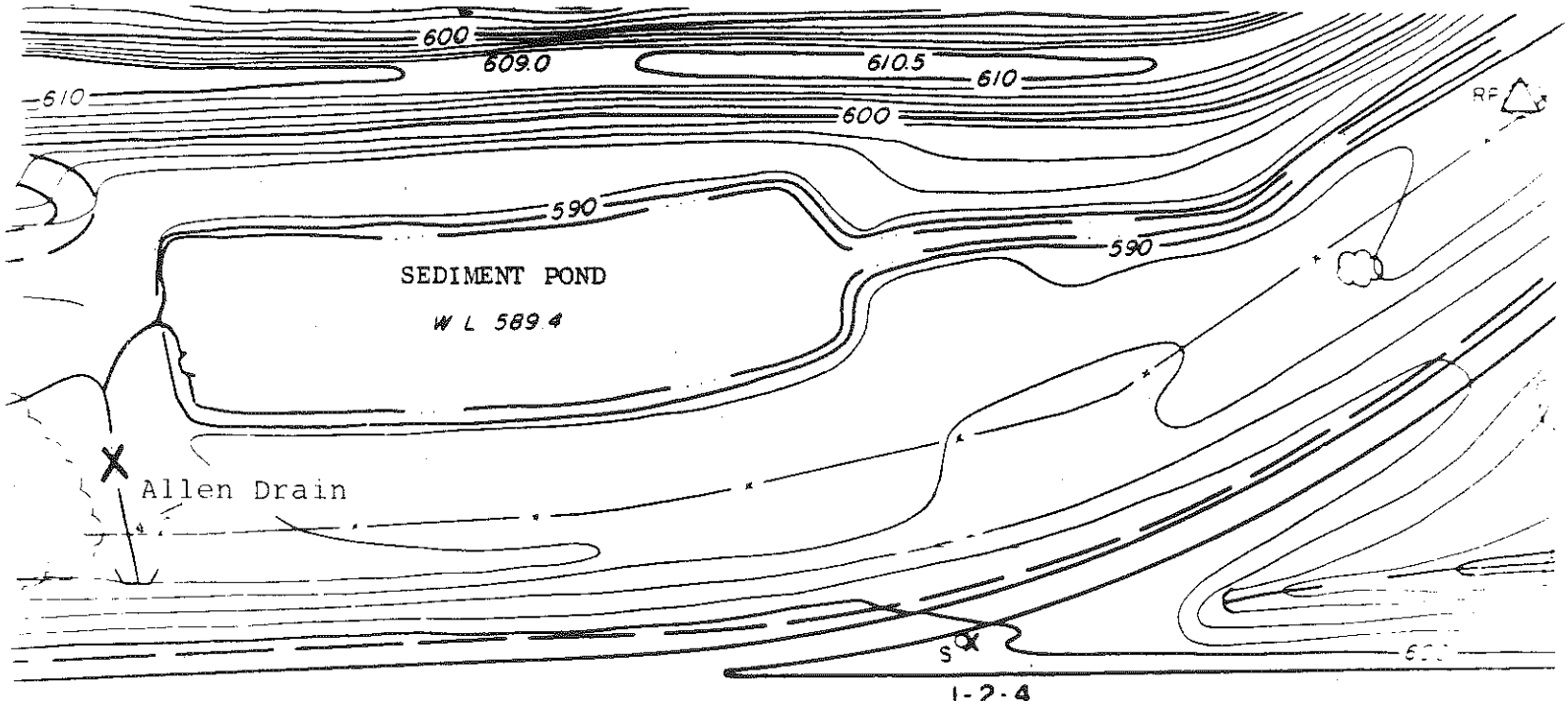


FIGURE 1-B

Section N
Environmental Monitoring

Ford Allen Park Clay Mine

BENCH MARK NOTE

ELEVATIONS INDICATED HEREON RELATE TO USGS DATUM

BM F-33 EL 595.75

WAYNE COUNTY ROAD COMMISSION BRONZE TABLET IN BRIDGE CONCRETE SIDEWALK, SOUTHWESTERLY CORNER OF OAKWOOD BOULEVARD - SOUTHFIELD FREEWAY BRIDGE.

LEGEND

POLE o
LIGHT oL
SIGN /S oS
FENCE ———x———
CULVERT) (
CONTOURS 600 610
TRANSMISSION TOWER
WATER LEVEL W L 589.5
TREE & TIMBER
ELEVATIONS OBTAINED BY GROUND SURVEY
CONTOUR INTERVAL - 2 FT.

N

X 1-2-6 600.64

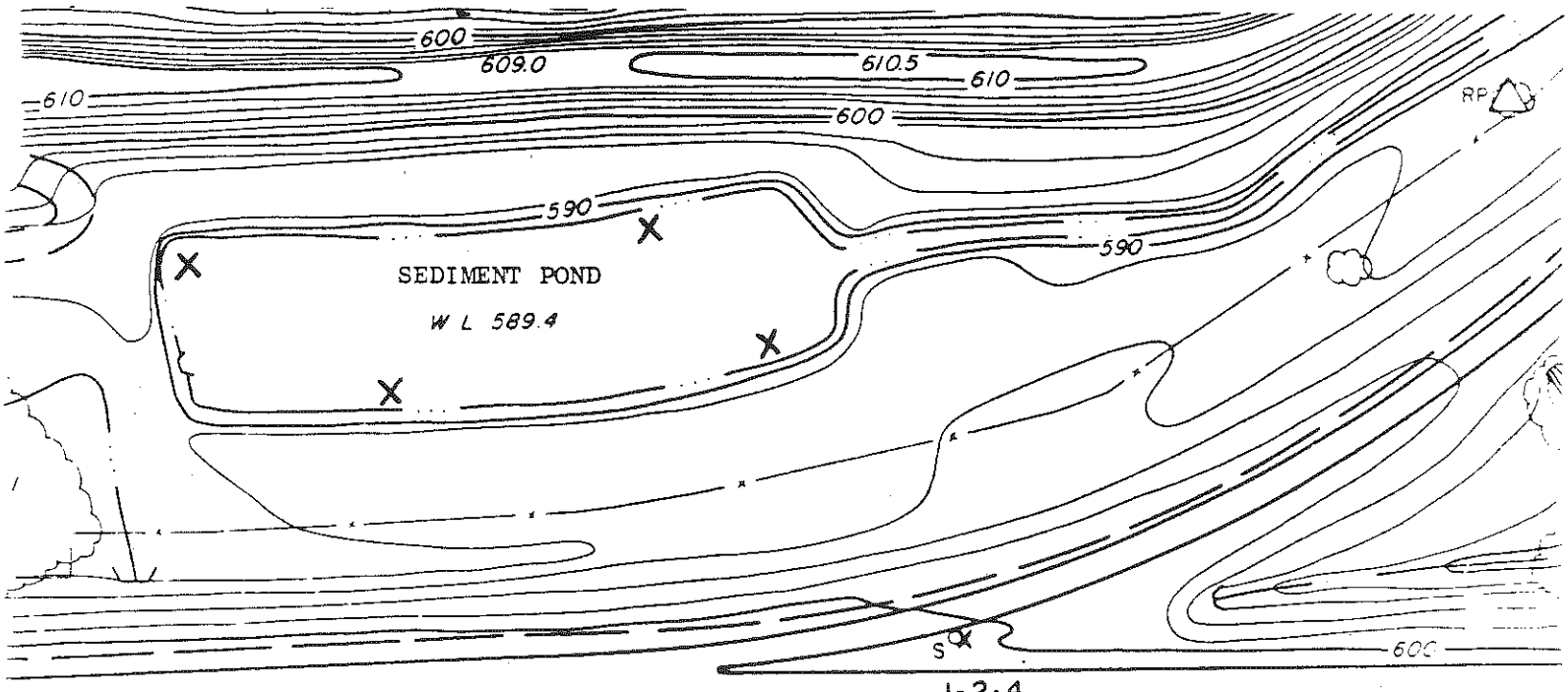


FIGURE 1-E

Section N
Environmental Monitoring

Ford Allen Park Clay Mine

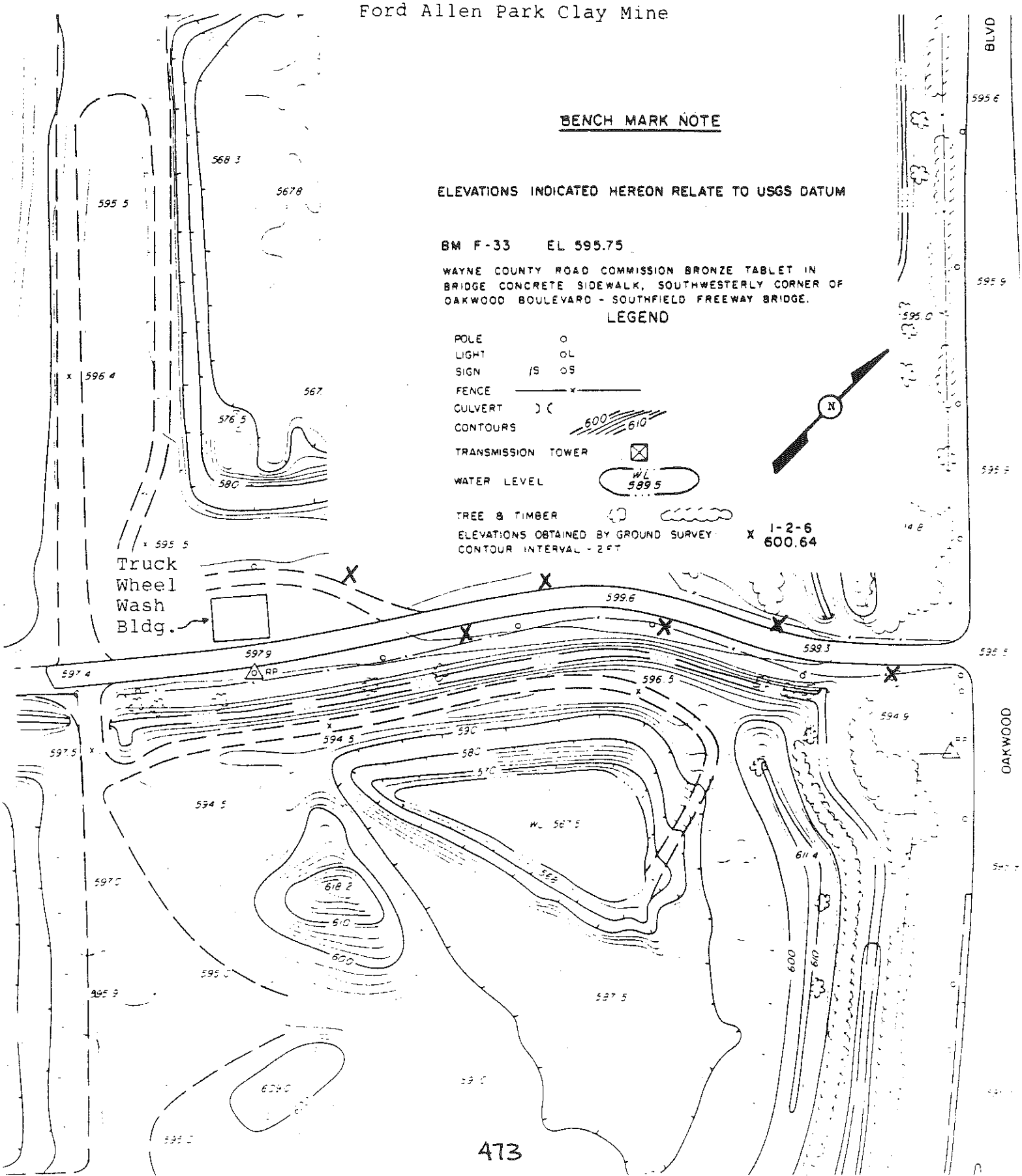


Figure 1-G

FORD MOTOR COMPANY ALLEN PARK CLAY MINE

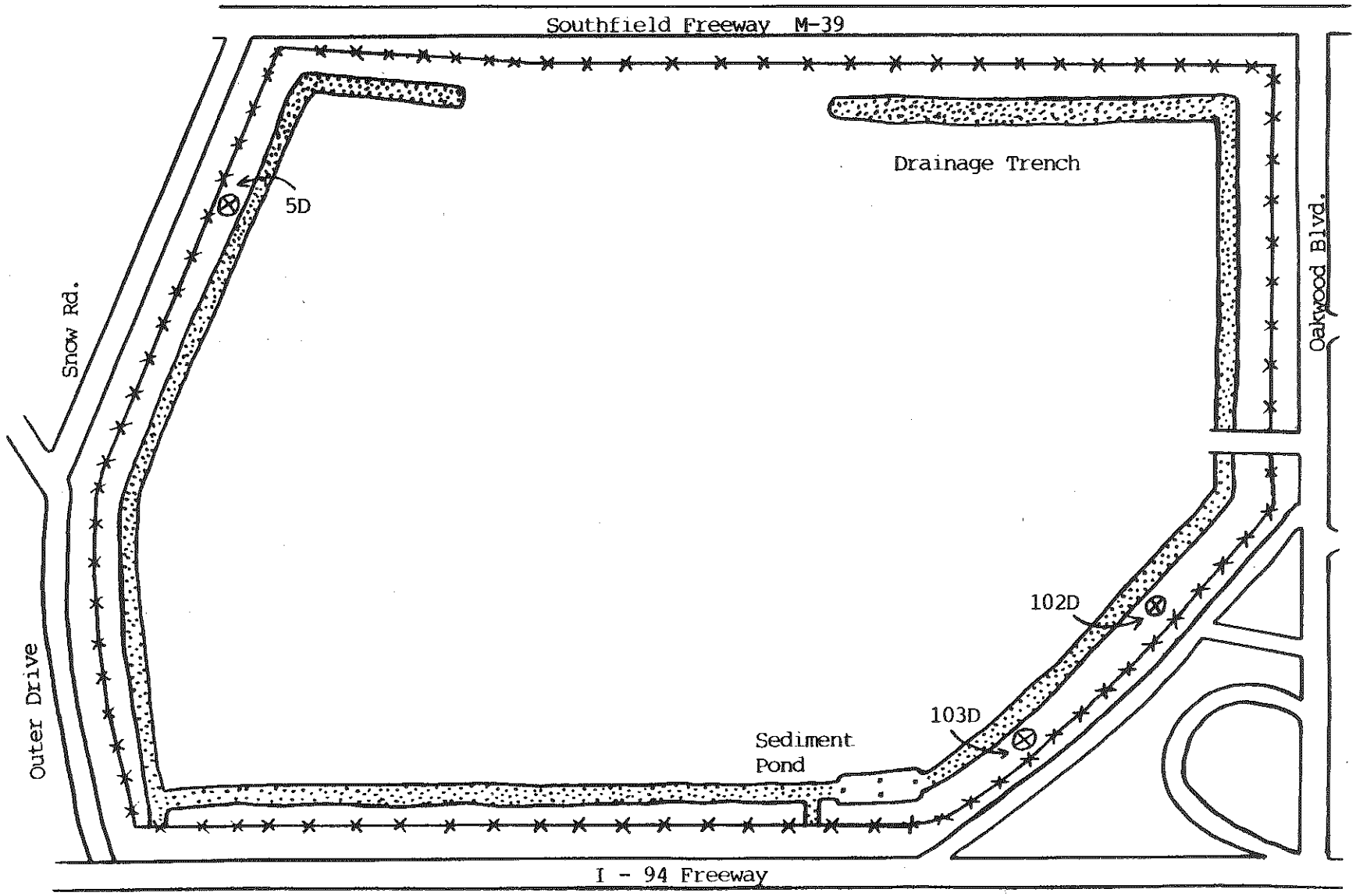


Figure 1-G

Figure2-G

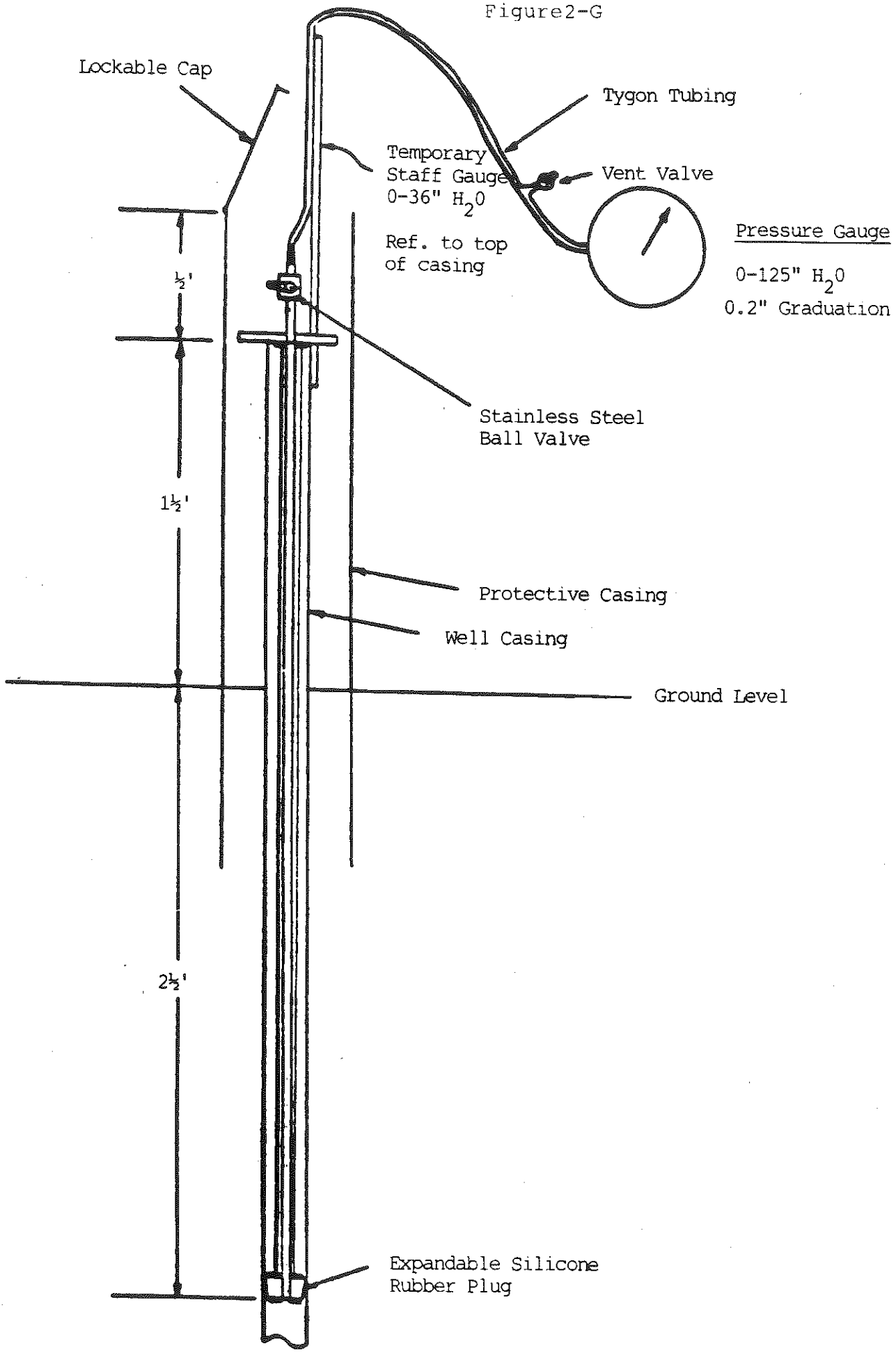
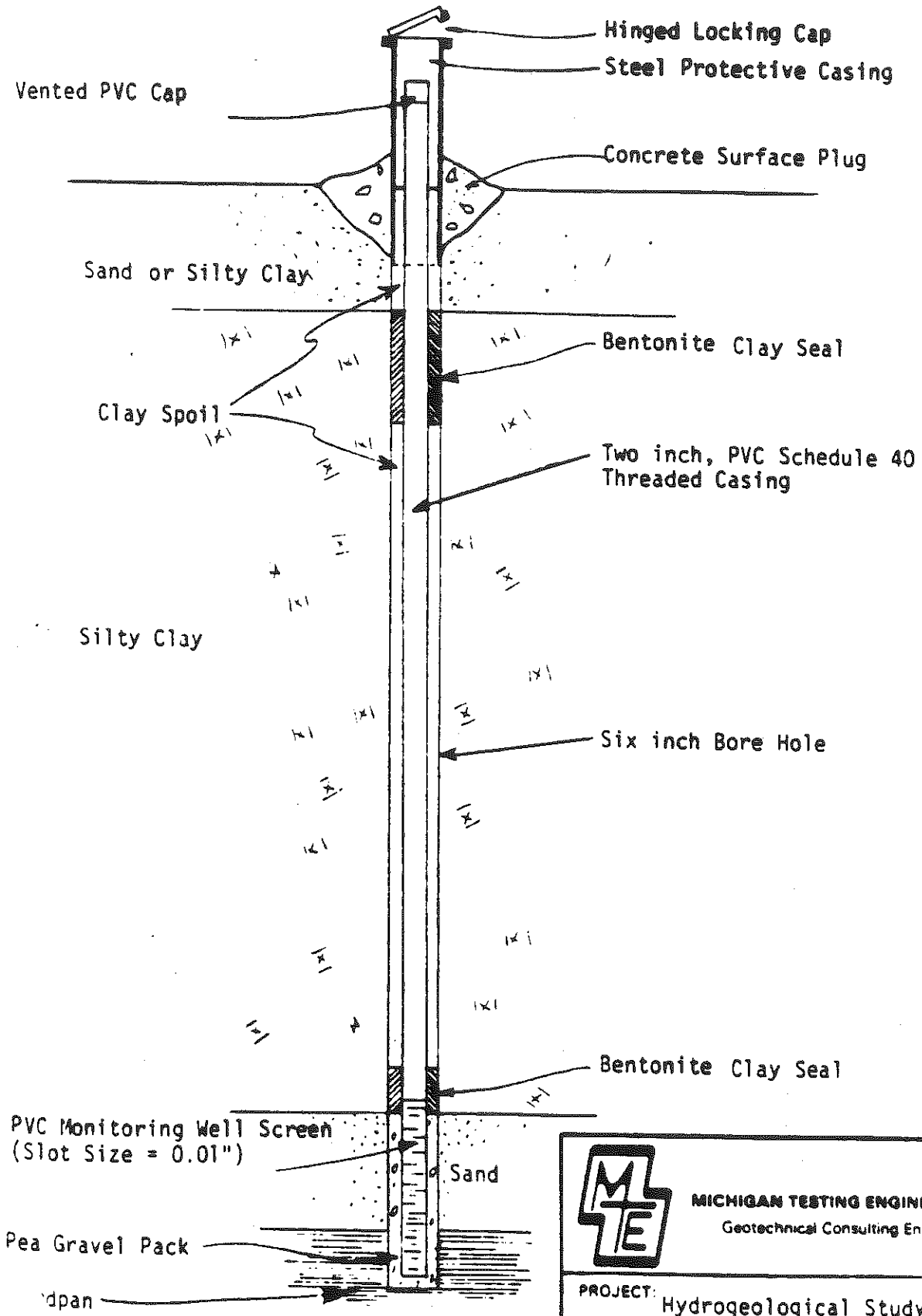

Lockable Cap
Tygon Tubing
Temporary
Staff Gauge
0-36" H_2O
Ref. to top
of casing
Vent Valve
Pressure Gauge
0-125" H_2O
0.2" Graduation
½'
Stainless Steel
Ball Valve
1½'
Protective Casing
Well Casing
Ground Level
2½'
Expandable Silicone
Rubber Plug

Figure 3-G

TYPICAL WELL CONSTRUCTION



MICHIGAN TESTING ENGINEERS, INC.
Geotechnical Consulting Engineers

PROJECT: Hydrogeological Study
Allen Park Clay Mine

Job: 406-15046 Date: Aug. 1981

Ford Allen Park Clay Mine

Fig. 1-H

FIGURE 1-H

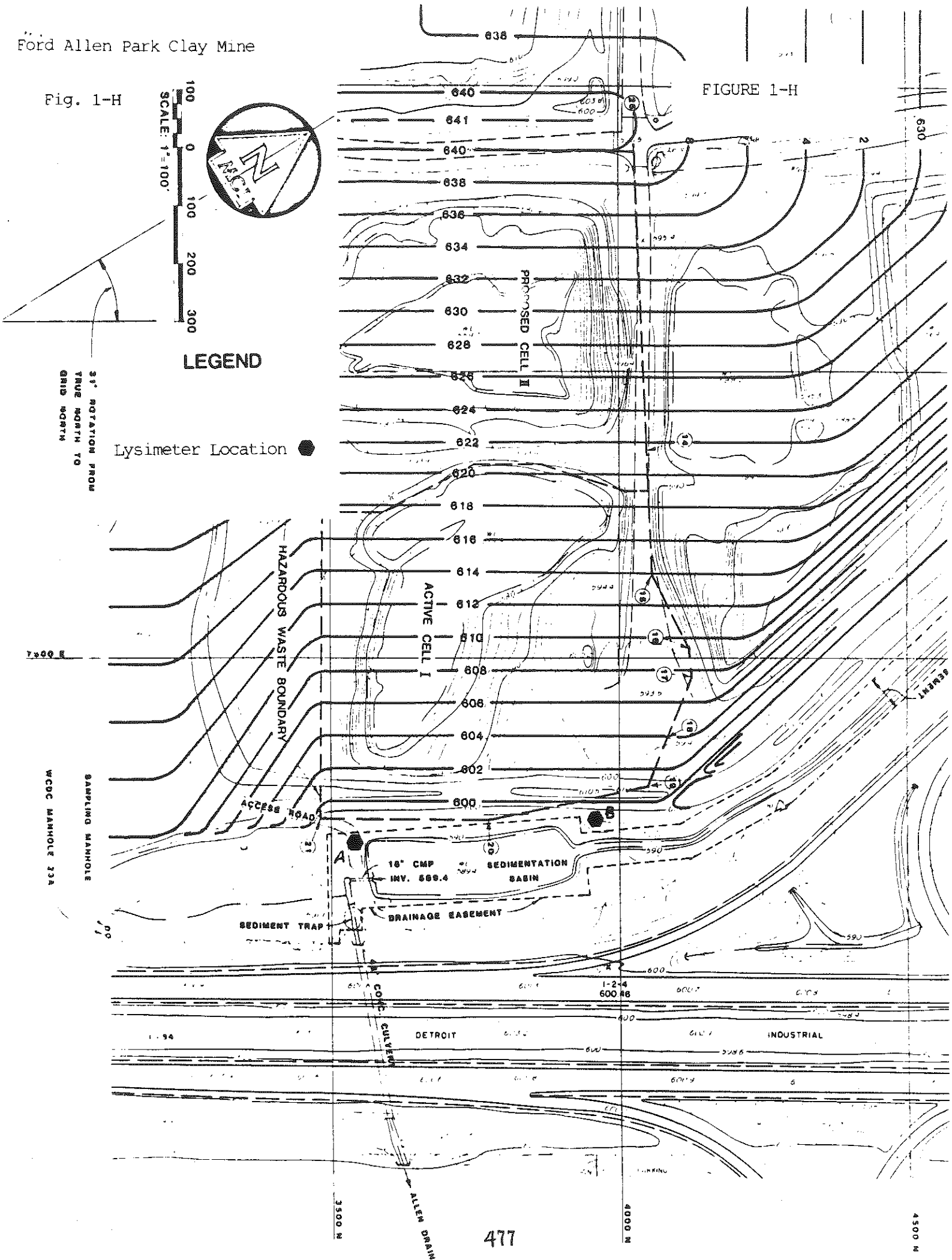


FIGURE 2-H

TYPICAL LYSIMETER CONSTRUCTION

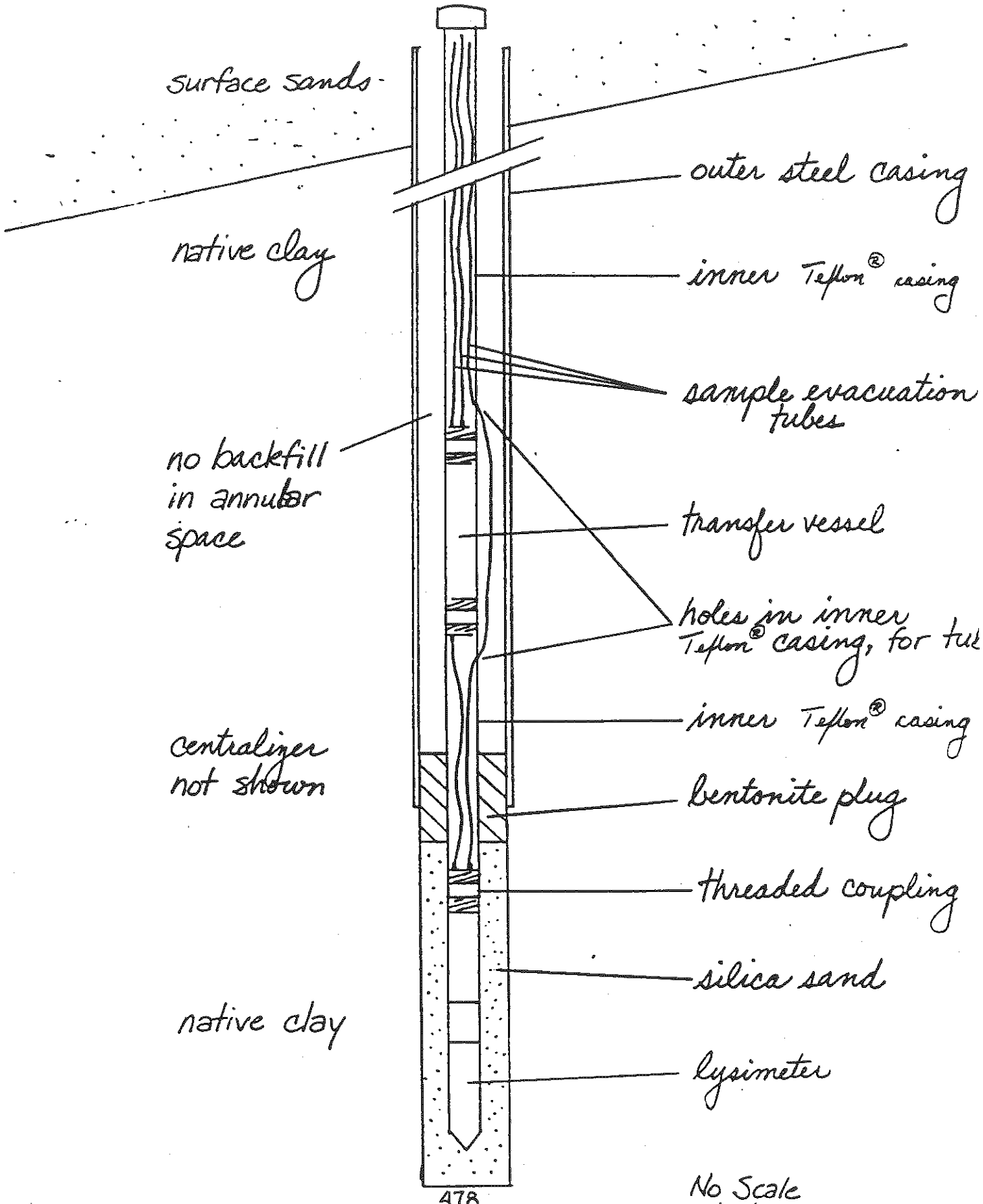
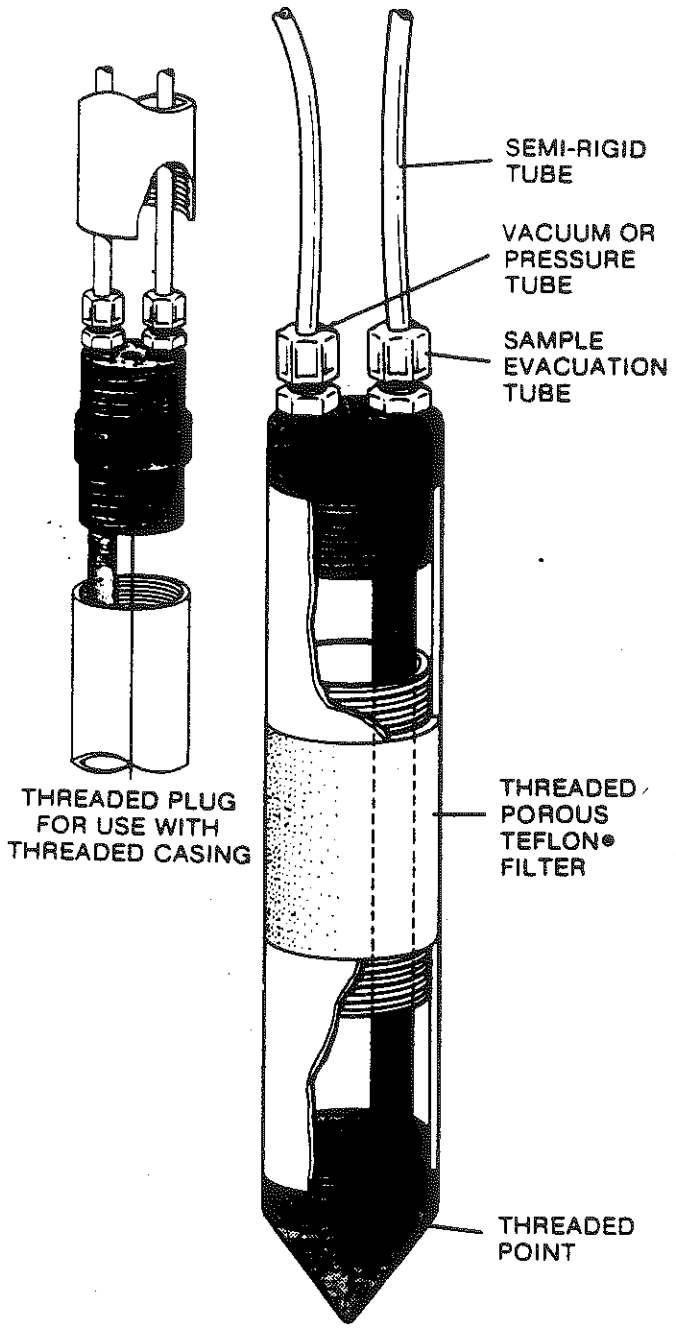


FIGURE 3-H

TIMCO™

Shallow Sampling Vacuum-Pressure Lysimeter



- SHALLOW SAMPLING VACUUM-PRESSURE LYSIMETER is designed to retrieve a sample from an unsaturated zone at depths up to 10 feet.
- All threaded construction for ease of decontamination.
- Available in PVC or Teflon®.
- Porous medium is virgin Teflon®.
- Tygon or Teflon® tubing is available with all TIMCO™ LYSIMETERS.

SIZES AVAILABLE

2.375 inches O.D. x 17 1/2 inches long.
(60.33mm O.D. x 444.5mm long)
Porous Teflon® medium: pore sizes available to your specifications.

NOTE: TIMCO'S™ recommended typical installation procedure instructions are available upon request.

TIMCO

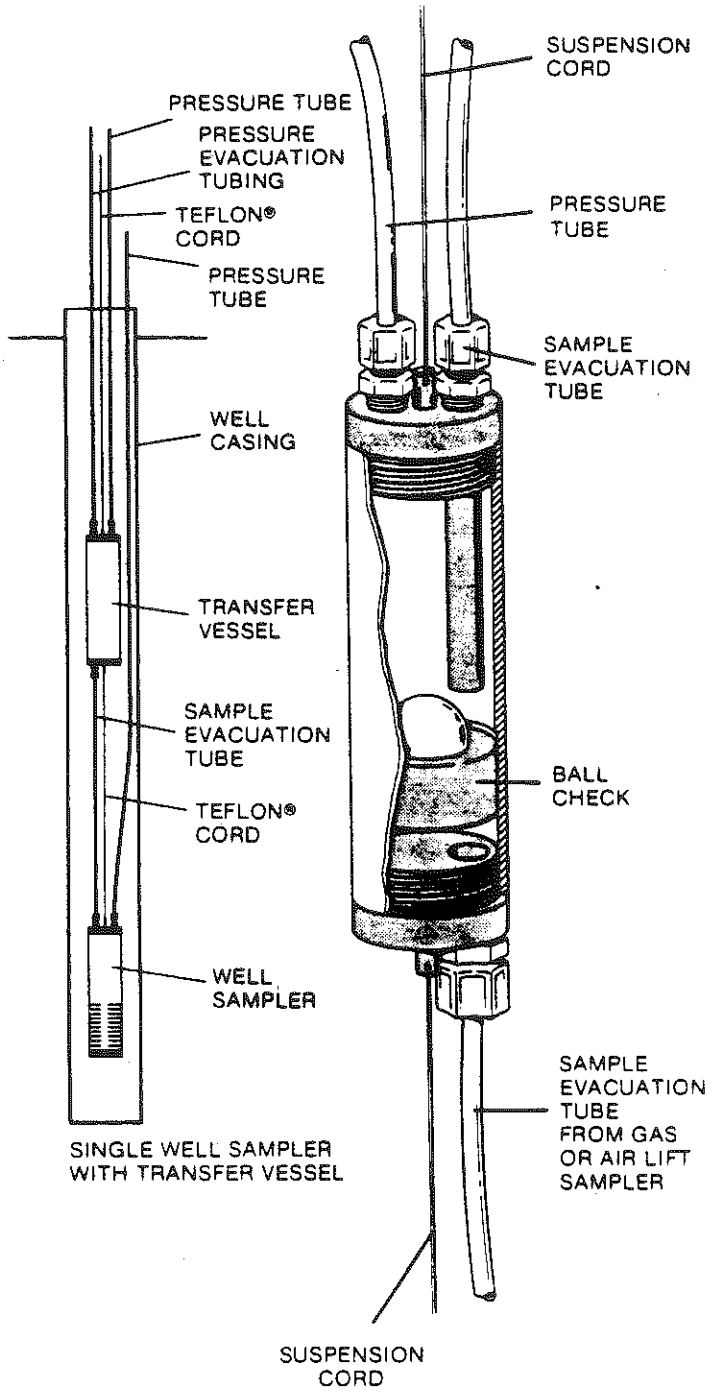
Timco Mfg. Co., Inc. P.O.Box 35 Prairie du Sac, WI 53578 (608)643-8534

G 382-15

FIGURE 4-H

TIMCO™

Transfer Vessel



- TRANSFER VESSEL is designed for use with TIMCO™ AIR or GAS LIFT SAMPLERS.
- Retrieves a sample from depths over 150 feet.
- Installed at 100 foot intervals to obtain samples from extreme depths.
- Available in PVC or Teflon®
- Suspension cord is Teflon® coated fiberglass.
- Use of TIMCO™ PORTABLE AIR or GAS FLOW VARIABLE TIMER eliminates gas or air contamination of sample.

SIZES AVAILABLE

1.25 inches I.D. - 1.66 inches O.D.
(31.75mm I.D. - 42.16mm O.D.)
1.47 inches I.D. - 1.90 inches O.D.
(37.34mm I.D. - 48.26mm O.D.)
1.91 inches I.D. - 2.375 inches O.D.
(48.51mm I.D. - 60.33mm O.D.)
Standard Sample chamber length: 18 inches.

NOTE: TIMCO'S™ recommended typical installation procedure instructions are available upon request.

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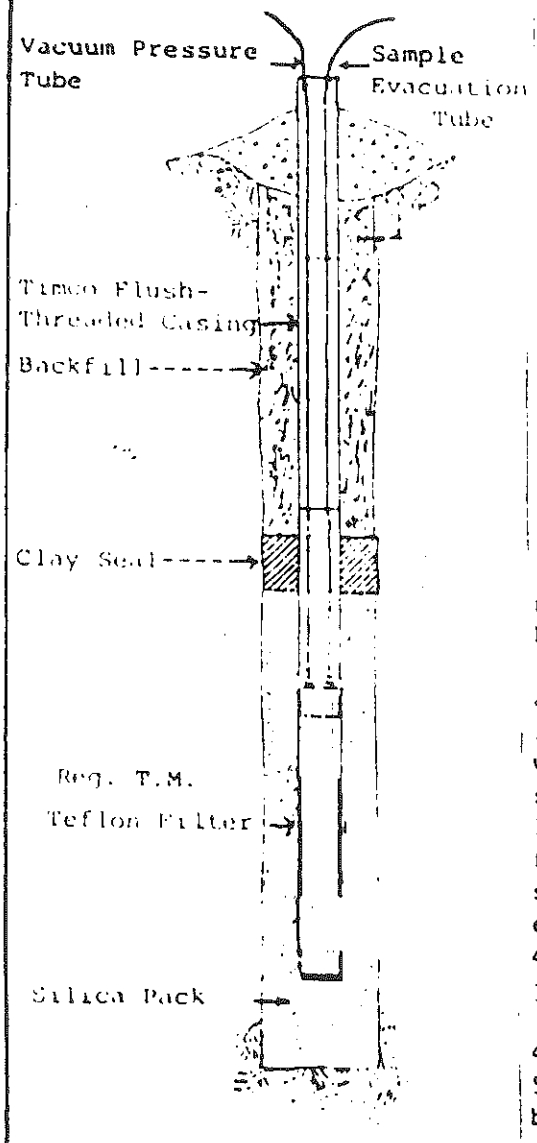
FIGURE 5-H

INSTALLATION OF A TIMCO LYSIMETER



Reg. T.M. "Teflon" Dupont Registered Trademark

1. Check to make sure all joints and fittings on the lysimeter and tubes are tight. This can be easily ascertained by immersing the entire unit in distilled water and applying no more than 20 lbs. of air pressure. Observe all connections and joints for air bubbles except for the porous filter portion. The porous filter portion should give off bubbles over the entire surface. If any leaks are observed at any point other than the porous filer, the connections should be slightly tightened and checked again. If leaks are still observed, Teflon tape should be used on the threads and the unit re-assembled and checked. Also check for leaks at the plug, stop-cock, clamp, vacuum-pressure gauge or other devices to be used at the top of the tubes at the top of the borehole.
2. For a Two inch diameter lysimeter, drill a six inch borehole or larger. It is recommended that as a minimum there be at least one and one-half inches on each side of the lysimeter for the silica pack. (If difficulties are encountered in maintaining an open borehole, use casing to hold back the material. After installation of the silica pack and lysimeter, pull back the casing and install a bentonite plug.)
3. Make a slurry of silica using 150 ML. distilled water and 450 grams of 200 mesh silica flour; suggested use, 50-60 lbs. of silica flour per lysimeter. (2 gals. water to 50-60 lbs. silica flour). Care should be taken to blend water and silica completely, make certain that no "lumps" exist.
4. Pour part of the silica slurry into the borehole just prior to installation of the lysimeter. (Minimum of 1½ inches in the bottom for tube type, 4 inches for cup type).
5. Place the lysimeter into the borehole, care being taken to ensure that the lysimeter is centrally located. A minimum of 1½ inches of silica pack around the annulus area of the unit is essential. We suggest that the lysimeter should be ordered with a threaded top plug which allows use of TIMCO flush threaded riser pipe with attached centralizers to ensure centering.

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FIGURE 5-H (cont'd)

6. Pour the balance of the silica slurry around the lysimeter ensuring that the entire unit is completely covered. This will allow for any "settling" or slumping of the silica pack as moisture is withdrawn.
7. Place a bentonite seal above the silica pack followed by tamped backfill. A bentonite surface seal or other type of seal is also recommended. The best of course, is a steel security cover with a lock, set in concrete.
8. Clamp off or plug the sample evacuation tube. (If Teflon tubes are being used, use a Teflon plug or a Teflon stop-cock as crimping will do damage to the tube.)
9. Using a vacuum-pressure hand pump or a portable vacuum pump, apply 18 to 21 inches of mercury. We recommend that a stop-cock be installed in the vacuum-pressure line at the surface as well as a vacuum-pressure gauges. If a gauge is not installed, there is no accurate way of determining the amount of initial vacuum or how much vacuum may be left at a later time. A stop-cock ensures no loss of vacuum as the pump is being disconnected, especially with the Teflon tubing, as previously mentioned may not be crimped or clamped off without damaging the tube.
10. When the vacuum-pressure gauge indicates less than 10 inches of mercury (approximately 24 hours), a sample should be attempted.
11. SAMPLE RETRIEVAL OF THE SHALLOW TYPE: Using a sample flask that is more than adequate for the volume of the lysimeter, with a two hole stopper at the top, insert and secure the sample or evacuation tube in one of the holes, making certain that the tube clears the bottom of the stopper by at least ½ of an inch. Using another tube of adequate length, attach one end to the vacuum pump and insert the other end of the tube thru the other hole in the stopper (have tube flush with the bottom of the stopper) and apply vacuum. Vacuum should be repeated until no further sample is obtained. Remove the tubes from the sample flask, repeat procedure number 6 thru 10. Discard from the first sample OR SAMPLES, approximately 20% of the volume of the water used to mix the silica pack. Depending upon soil moisture and other factors, the second and subsequent samples may take up to 48 hours or longer to obtain a full sample. A vacuum pressure of less than 10 inches will indicate that a sample should be taken. We suggest that the installation be checked each 24 hours.
12. SAMPLE RETRIEVAL UTILIZING THE TRANSFER VESSEL AT DEPTHS BELOW 30 FEET. Before installation of the lysimeter attach the transfer vessel 5'-10' above the lysimeter as in figure No. 2. Follow procedures 1 thru 10. Using a sample flask that is more than adequate for the volume of the lysimeter, insert and secure the sample or evacuation tube in a vented sample flask. Attach the gas or pressure tank to the vacuum-pressure tube attached to the lysimeter setting the pressure not to exceed 2½-5 lbs., forcing the sample into the

FIGURE 5-H (cont'd)

transfer vessel. By using this amount of lbs. of pressure the lysimeter will not be overpressurized causing the silica pack to separate from the teflon filter. Then attach the gas or pressure tank to the second pressure tube which is attached to the transfer vessel. Set the pressure at about .42 lbs. per foot of depth. Apply pressure until all sample is obtained. Discard from the first sample OR SAMPLES, approximately 20% of the volume of the water used to mix the silica pack. Depending upon soil moisture and other factors, the second and subsequent samples may take up to 48 hours or longer to obtain a full sample. A vacuum pressure of less than 10 inches will indicated that a sample should be taken. We suggest that the installation be checked each 24 hours.

NOTE: We further recommend that a 99.9% pure silica be used in the silica pack. Chemical analysis of one-half of one per cent impurities are available upon request. For critical installations, pure silica is avaialable but is extremely expensive.

FURTHER NOTE: If a vacuum is used in a lysimeter installation less than 26 feet in depth, or where a power source is available with controls to maintain a constant vacuum (a sample flask of sufficient volume should be used on the vacuum-pressure line to prevent damage to the pump or controls. The installation should be checked each 24 hours).

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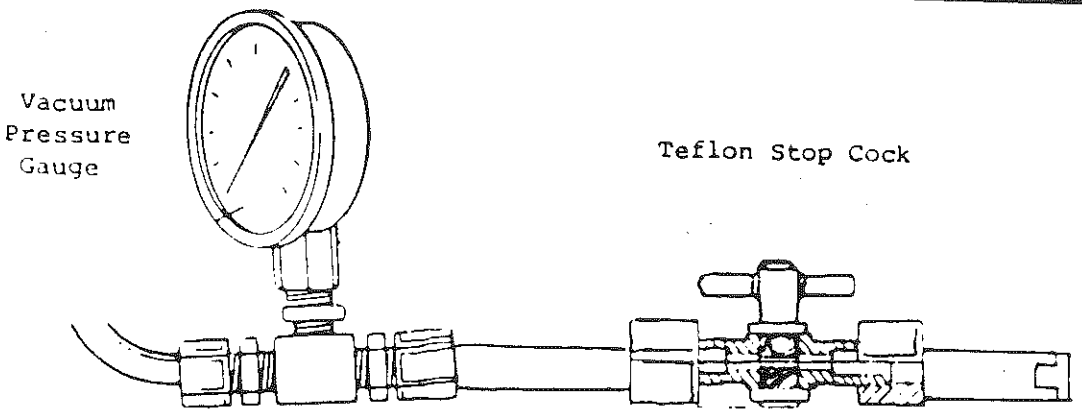
FIGURE 5-H (cont'd)



For lysimeter installations, the Vacuum-Pressure gauge is adapted to a teflon T fitting which is attached to the teflon ¼" O.D. tube. The teflon tube is cut and grooved with a groover to allow the fittings to tighten properly so the tube does not slip out. At this point a teflon stop-cock is installed, then a teflon plug is inserted in the end of the tube.

All fittings should be tightened with a wrench.

Pressure source tubes and sample evacuation tube should each have a teflon stop-cock and end plug installed.

While it is desireable to attach a teflon stopcock at the end of the tube as mentioned above, shown below as a cost effective option. A piece of 3/8" O.D. x ¼" I.D. tygon tube is placed over the teflon tube with a steel base clamp holding it in place. The end of the tygon tube is sealed off with a plastic gripping clamp.